

Exhaust System - TDV6 2.7L Diesel -

General Specifications

Item	Specification
Exhaust manifolds	Cast with cross over pipe from right to left hand manifold exiting into single turbocharger
Exhaust system	Single, stainless steel downpipe with twin stainless steel intermediate and tail pipes and stainless steel mufflers
Catalytic converter - type/location	Near coupled cascade - located in the down pipe

Torque Specifications

Description	Nm	lb-ft
Catalytic converter clamp without diesel particulate filter (DPF)	55	40
Catalytic converter clamp with DPF	48	35
Catalytic converter to muffler nuts	48	35
DPF to muffler nuts	48	35
* Catalytic converter to exhaust manifold nuts	48	35
Service clamp	48	35
Differential pressure sensor pipe unions	35	26
** Exhaust gas temperature sensors	35	26
DPF heat shield bolts	10	7

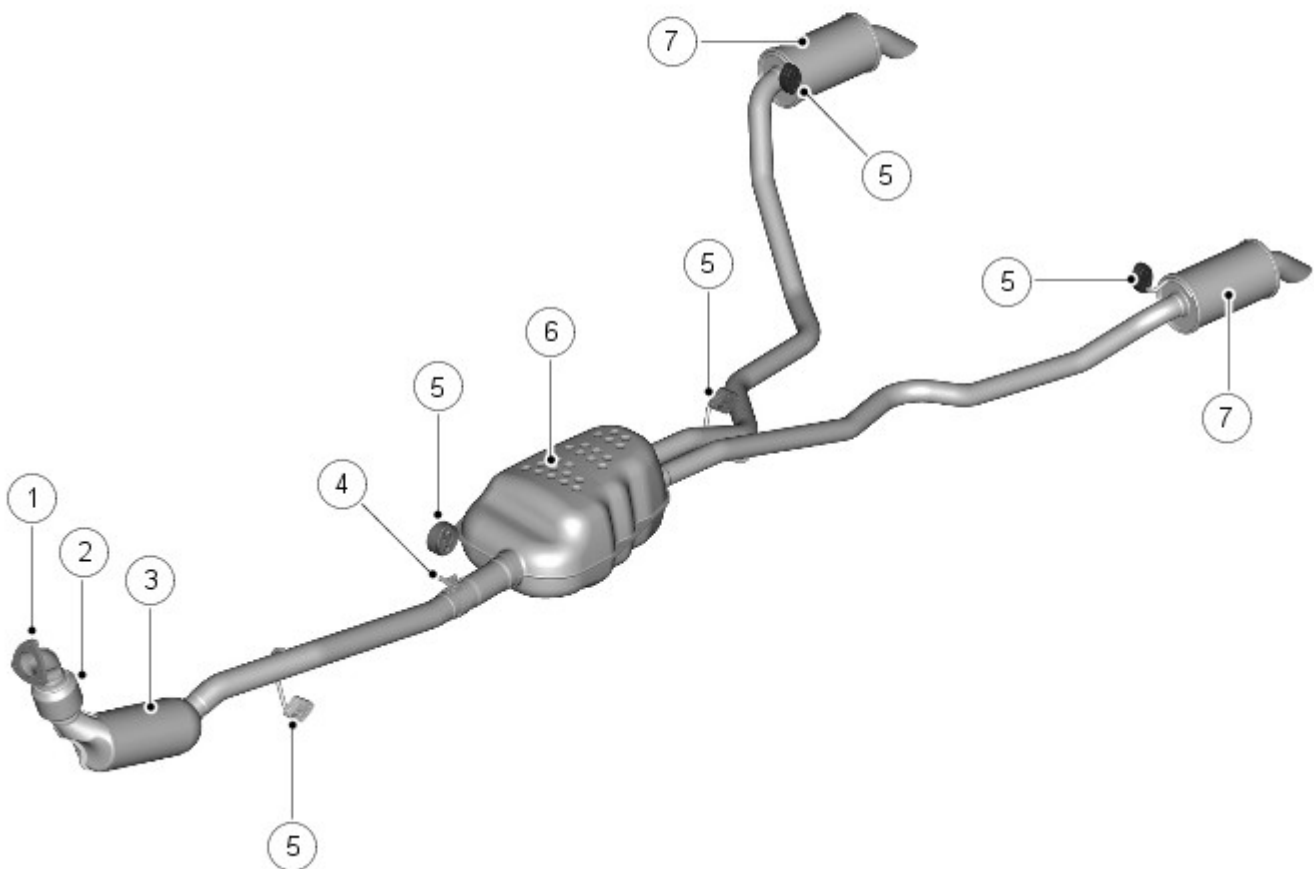
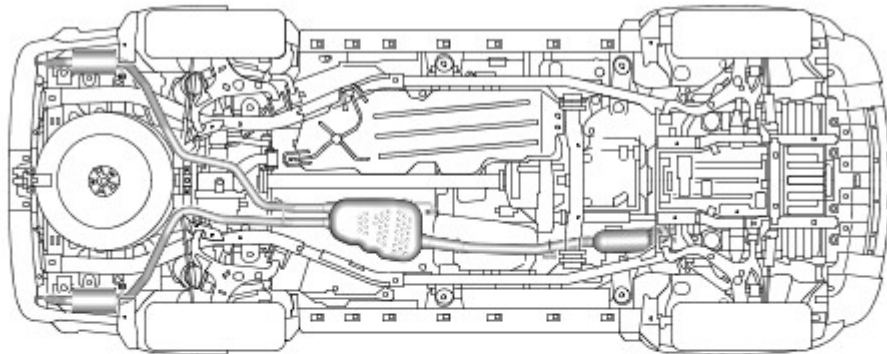
*** New nuts must be installed**

*** Apply suitable high temperature resistant anti-seize compound**

Exhaust System - TDV6 2.7L Diesel - Exhaust System

Description and Operation

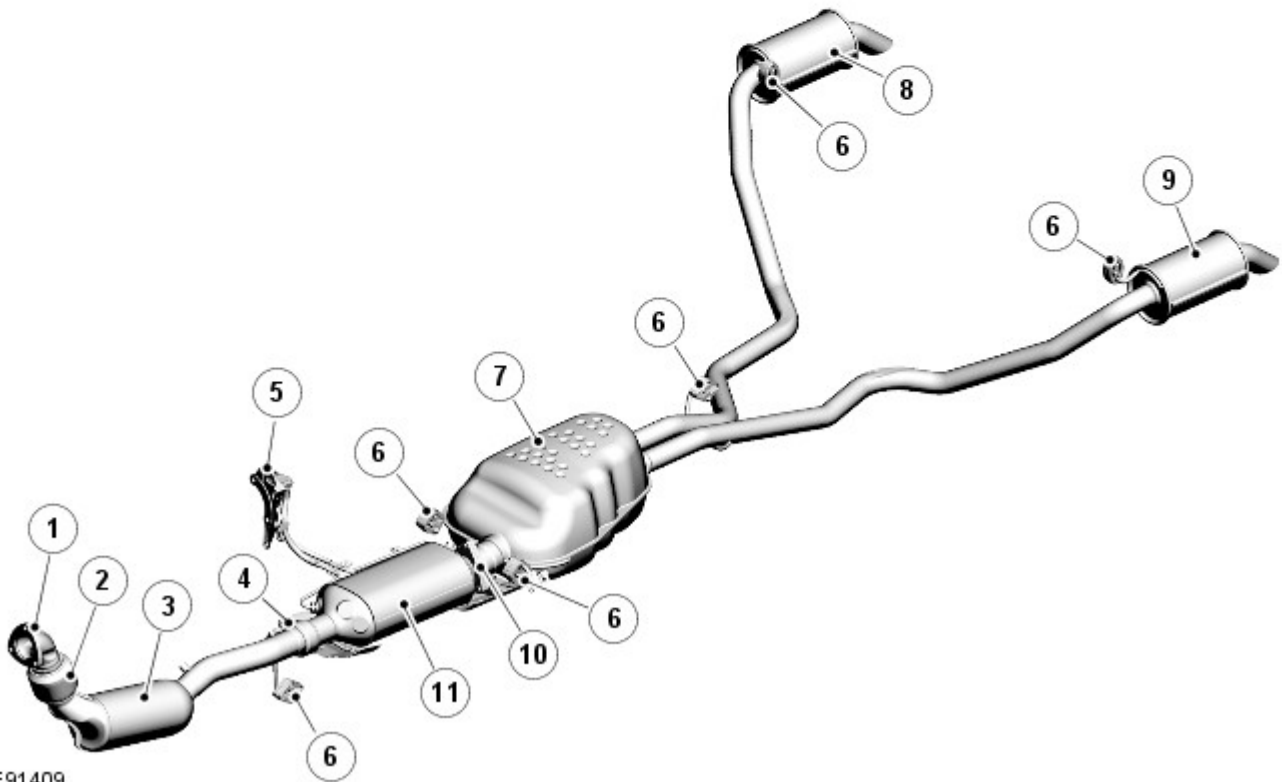
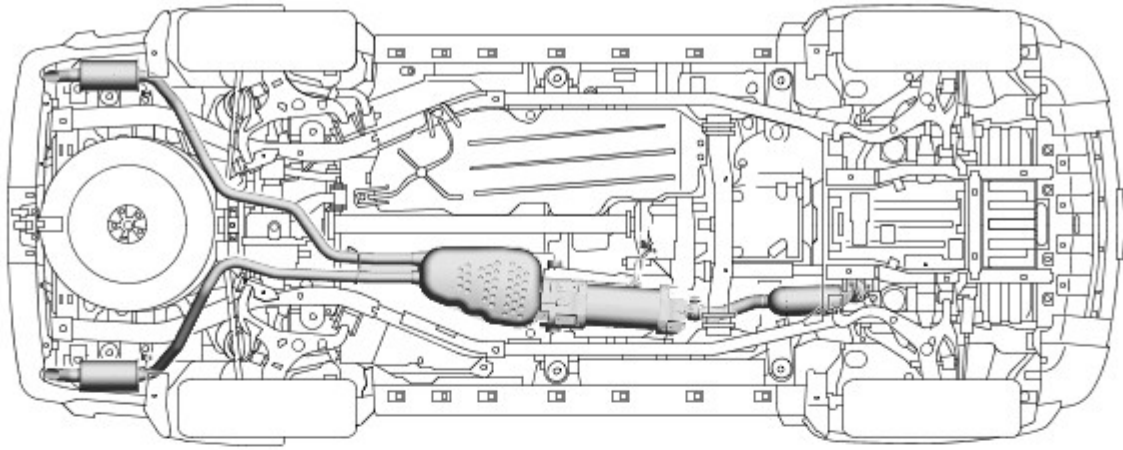
TDV6 EXHAUST SYSTEM COMPONENT LOCATION - WITHOUT DIESEL PARTICULATE FILTER



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Item	Part Number	Description
1	-	Inlet flange
2	-	Flexible de-coupler
3	-	Catalytic converter
4	-	Clamp
5	-	Mounting rubber (5 off)
6	-	Silencer - Centre
7	-	Silencer - Rear

TDV6 EXHAUST SYSTEM COMPONENT LOCATION - WITH OPTIONAL DIESEL PARTICULATE FILTER - FROM 2008 MY (WHERE FITTED)



E91409

Item	Part Number	Description
1	-	Inlet flange
2	-	Flexible de-coupler
3	-	Catalytic converter
4	-	Clamp
5	-	Differential pressure sensor
6	-	Mounting rubber (6 off)
7	-	Silencer - Centre
8	-	Silencer - Rear Left Hand (LH)
9	-	Silencer - Rear Right Hand (RH)
10	-	Flange joint and gasket
11	-	DPF

OVERVIEW

The TdV6 exhaust system is fabricated from stainless steel and is supplied as two separate assemblies; a front section incorporating a catalytic converter and a rear section incorporating a centre silencer and two rear silencers.

The system is attached to the underside of the body with five mounting rubbers which are located on mild steel hanger bars that are welded to the system. The mounting rubbers locate on corresponding hangers which are welded to the underside of the vehicle body.

The system has service repair items available. Indentations in the rear section between the center and the rear silencers show the cut points for the service replacement rear silencers or front section. When a service repair section is used, the joint is connected using a sleeve and two clamps to connect the pipes at the cut points.

On vehicles from 2008MY, an optional Diesel Particulate Filter (DPF) is available. The non-DPF exhaust system is also

available on vehicles from 2008MY as the DPF is not required to comply with EU4 emission regulations.

- **CAUTIONS:**



The use of bio-fuels can seriously contaminate and destroy the coatings used on the catalytic converter. The DPF and the catalytic converter can become irreversibly contaminated if non-specified oils or fuels are used. This will result in the vehicle being unable to regenerate the DPF, becoming non-compliant with tailpipe emission regulations and replacement of the catalytic converter and DPF will be required.



If the vehicle is waded in deep water and the engine is stopped with the tailpipes submerged, the water, which can enter the system, can also contaminate both the DPF and the catalytic converter. This again can result in catalytic converter damage and damaging the ability for the DPF to regenerate therefore requiring both components to be replaced.

FRONT SECTION

The front section has a welded flange with three holes which provide for the attachment to three studs on the turbocharger. The flange is sealed with a metal gasket. This is secured to the turbocharger studs with three nuts.

The flange is welded to a fabricated elbow which in turn is welded to the de-coupler. Fabricated pressings are welded between the de-coupler and the body of the catalytic converter. The converter outlet pipe is a 60 mm (2.2 in) diameter tube, with a 2.0 mm (0.079 in) wall thickness, which is welded to the converter body. The outlet pipe has hanger bar which provides for the location of a mounting rubber.

Vehicles without DPF

The rear of the outlet pipe from the catalytic converter locates into the rear section. When the front section is inserted into the flared end, a clamp is used to compress and secure the joint.

Vehicles with Optional DPF - From 2008MY

The rear outlet pipe from the catalytic converter has a flared end which slides onto the DPF inlet pipe and is secured with a clamp. The outlet pipe of the DPF has a triangular shaped flange which mates with a similar flange on the rear section of the exhaust. The 2 flanges are sealed with a metal gasket and are secured using 3 locknuts screwed onto captive studs located in the DPF flange.

REAR SECTION

Vehicles without DPF

On vehicles without DPF, the rear section has a short 70 mm (2.75 in) diameter tube, with a 1.5 mm (0.06 in) wall thickness, which provides location for the front section as previously mentioned. The tube is welded to the centre silencer assembly.

Vehicles with Optional DPF - From 2008MY

On vehicles from 2008MY fitted with the optional DPF, the rear section has a short 70 mm (2.75 in) with a triangular flange which mates with a similar flange on the front section as previously mentioned.

All Vehicles

The centre silencer comprises two pressed stainless steel shells which are welded together to give a capacity of 25.2 liters (1537 in³). The silencer contains baffles and perforated tubes which reduce noise as the exhaust gases pass through the silencer. Hanger bars are welded to the front right hand side and left hand side of the silencer and provide for the location of mounting rubbers.

The silencer has two 50 mm (2.0 in) diameter outlet pipes, with a 1.5 mm (0.06 in) wall thickness, which are curved to pass around the rear suspension components.

Each outlet pipe terminates in a welded joint with the rear silencers. The outlet pipes have a hanger bar which provides for the location of a mounting rubber.

A hanger bar is welded to the front face of each rear silencer and provides for the location of a mounting rubber. The silencer is a circular fabrication with a baffle tube which is surrounded with glass fiber to provide further noise suppression. Each silencer has a capacity of 2.7 liters (165 in³).

The silencers each have an outlet pipe which is 55 mm (2.16 in) diameter, with a wall thickness of 1.2 mm (0.05 in). Each outlet pipe is curved downwards to direct exhaust gasses away from the rear of the vehicle.

CATALYTIC CONVERTER

The engine management system provides accurately metered quantities of fuel to the combustion chambers to ensure the most efficient use of fuel and to minimise the exhaust emissions.

To further reduce the carbon monoxide and hydrocarbons content of the exhaust gases, a catalytic converter (Diesel Oxidation Catalyst) is integrated into the front pipe of the exhaust system. In the catalytic converter the exhaust gases are passed through honeycombed ceramic elements coated with a special surface treatment called 'washcoat'. The washcoat increases the surface area of the ceramic elements by a factor of approximately 7000. On top of the washcoat is a coating containing platinum on vehicles without a DPF or platinum and palladium on vehicles with a DPF, which are the active constituents for converting harmful emissions into inert by-products. The platinum and palladium adds oxygen to the carbon monoxide and the hydrocarbons in the exhaust gases, to convert them into carbon dioxide and water.

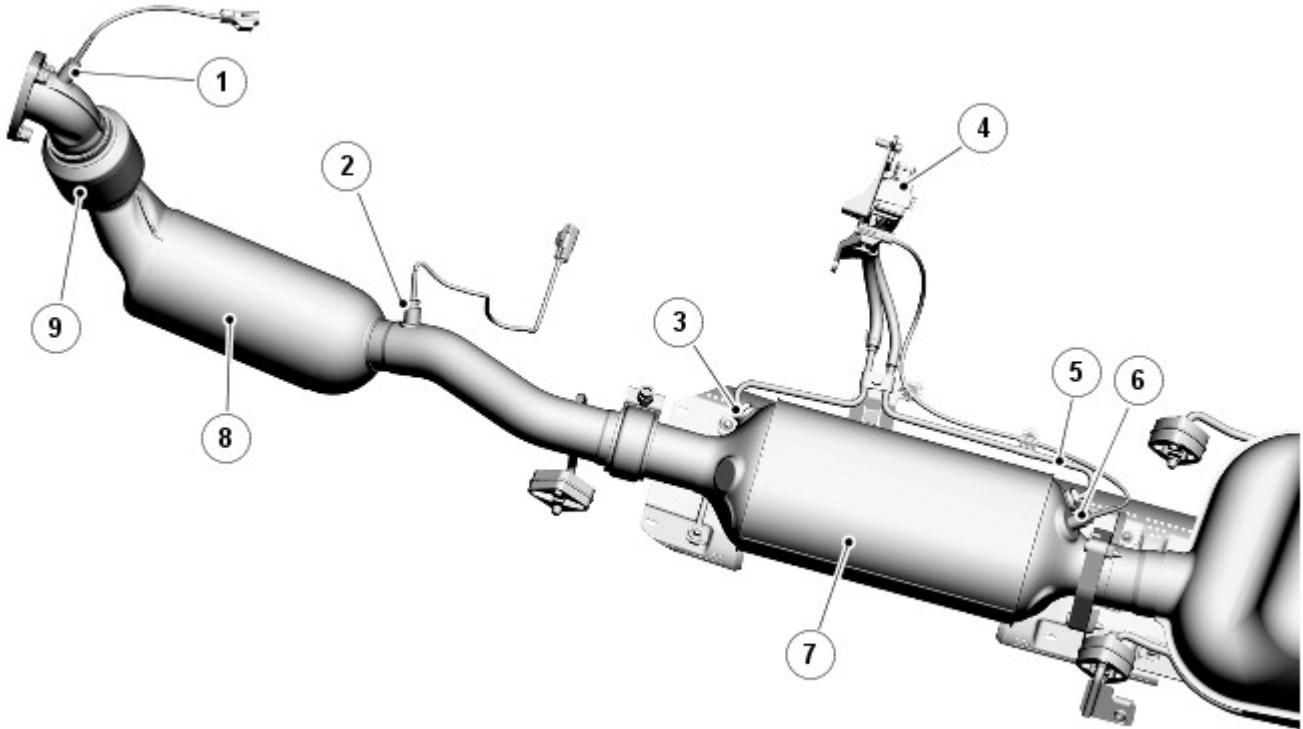
DIESEL PARTICULATE FILTER (DPF) - VEHICLES FROM 2008MY (WHERE FITTED)

On vehicles from 2008MY, an optional Diesel Particulate Filter (DPF) is available.

- NOTE: The non-DPF exhaust system is also available on vehicles from 2008MY.

The DPF system reduces diesel particulate emissions to negligible levels.

DPF System Components



E91610

Item	Part Number	Description
1	-	Exhaust gas temperature sensor (pre catalyst)
2	-	Exhaust gas temperature sensor (post catalyst)
3	-	High pressure sensor pipe
4	-	Differential pressure sensor
5	-	Low pressure sensor pipe
6	-	Exhaust gas temperature sensor (Post DPF)
7	-	Diesel particulate filter
8	-	Catalytic converter

The particulate emissions are the black fumes emitted from the diesel engine under certain load conditions. The emissions are a complex mixture of solid and liquid components with the majority of the particulates being carbon microspheres on which hydrocarbons from the engine's fuel and lubricant condense.

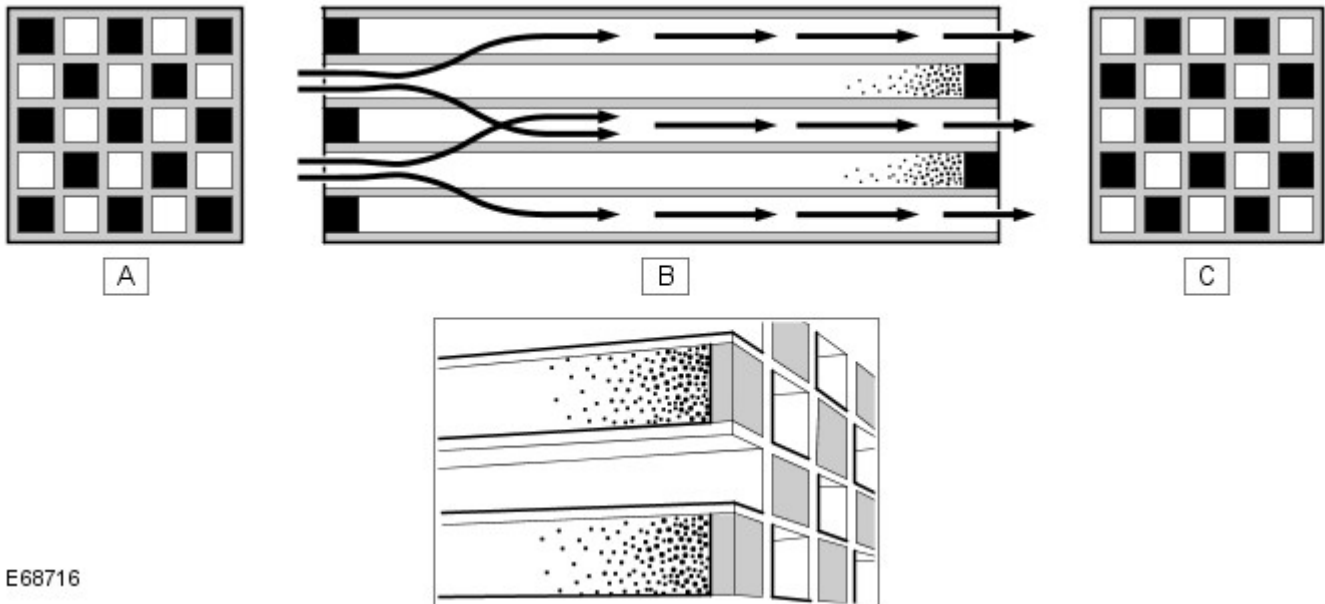
The DPF system comprises the following components:

- Diesel particulate filter
- DPF control software incorporated into the Engine Control Module (ECM)
- Differential pressure sensor.

Diesel Particulate Filter

The DPF is located in the exhaust system, downstream of the catalytic converter. A major feature of the DPF is its ability for regeneration. Regeneration is the burning of particulates trapped by the filter to prevent obstruction to the free flow of exhaust gasses. The regeneration process takes place at calculated intervals and is not noticeable by the driver of the vehicle.

Regeneration is most important, since an overfilled filter can damage the engine through excessive exhaust back pressure and can itself be damaged or destroyed. The material trapped in the filter is in the most part carbon particles with some absorbed hydrocarbons.



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Item	Part Number	Description
A	-	Front face showing alternate closed cells
B	-	Side view showing exhaust gas flow through the filter and particulate build up
C	-	Rear face showing alternate closed cells

The DPF uses a filter technology based on a filter with a catalytic coating. The DPF is made from silicon carbide housed in a steel container and has excellent thermal shock resistance and thermal conductivity properties. The DPF is designed for the engine's operating requirements to maintain the optimum back pressure requirements.

The porous surface of the filter consists of a number of small parallel channels positioned in the longitudinal direction of the exhaust system. Adjacent channels in the filter are alternately plugged at the end. This design forces the exhaust gasses to flow through the porous filter walls, which act as the filter medium. Particulate matter which are too big to pass through the porous surface are collected and stored in the channels.

The collected particulate matter, if not removed, can create an obstruction to exhaust gas flow. The particles are removed by a regeneration process which oxidizes the particles.

DPF regeneration is controlled by the temperature of the exhaust gasses and the DPF. The DPF includes a wash coat to the filter surface which comprises platinum and other active components and is similar to the catalytic converter. At certain exhaust gas and DPF temperatures the wash coat promotes combustion of the particles in addition to oxidizing carbon monoxide and hydrocarbon emissions.

The exhaust gas and DPF temperatures are controlled by the DPF software located in the ECM. The DPF software monitors the load status of the DPF based on driving style, distance travelled and signals from the differential pressure sensor and temperature sensors. When the particulate loading of the DPF reaches predetermined levels, the DPF is actively regenerated by adjusting, in conjunction with the ECM, various engine control functions such as:

- fuel injection
- intake air throttle
- exhaust gas recirculation
- turbocharger boost pressure control.

The regeneration process is possible because of the flexibility of the common-rail fuel injection engine which provides precise control of fuel flow, fuel pressure and injection timing which are essential requirements to promote the efficient regeneration process.

Two processes are used to regenerate the DPF; passive and active.

Passive Regeneration

Passive regeneration requires no special engine management intervention and occurs during normal engine operation. The passive regeneration involves a slow conversion of the particulate matter deposited in the DPF into carbon dioxide. This process is active when the DPF temperature reaches 250°C (482°F) and is a continuous process when the vehicle is being driven at higher engine loads and speeds.

During passive regeneration, only a portion of the particulate matter is converted into carbon dioxide. This is due to the chemical reaction process which is only effective within the normal operating temperature range of 250°C to 500°C (482°F to 932°F).

Above this temperature range the conversion efficiency of the particulates into carbon dioxide increases as the DPF temperature is raised. These temperatures can only be achieved using the active regeneration process.

Active Regeneration

Active regeneration starts when the particulate loading of the DPF reaches a threshold as monitored or determined by the DPF control software. The threshold calculation is based on driving style, distance travelled and back pressure signals from the differential pressure sensor.

Active regeneration generally occurs every 450 miles (725 km) although this is highly dependant on how the vehicle is driven. For example, if the vehicle is driven at low loads in urban traffic regularly, active regeneration will occur more

often. This is due to the rapid build-up of particulates in the DPF than if the vehicle is driven at high speeds when passive regeneration will have occurred.

The DPF software incorporates a mileage trigger which is used as back-up for active regeneration. If active regeneration has not been initiated by a back pressure signal from the differential pressure sensor, regeneration is requested based on distance travelled.

Active regeneration of the DPF is commenced when the temperature of the DPF is increased to the combustion temperature of the particles. The DPF temperature is raised by increasing the exhaust gas temperature. This is achieved by introducing post-injection of fuel after the pilot and main fuel injections have occurred.

This is determined by the DPF software monitoring the signals from the two DPF temperature sensors to establish the temperature of the DPF. Depending on the DPF temperature, the DPF software requests the ECM to perform either one or two post-injections of fuel:

- The first post-injection of fuel retards combustion inside the cylinder which increases the temperature of the exhaust gas.
- The second post-injection of fuel is injected late in the power stroke cycle. The fuel partly combusts in the cylinder, but some unburnt fuel also passes into the exhaust where it creates an exothermic event within the catalytic converter, further increasing the temperature of the DPF.

The active regeneration process takes approximately 20 minutes to complete. The first phase increases the DPF temperature to 500°C (932°F). The second phase further increases the DPF temperature to 600°C (1112°F) which is the optimum temperature for particle combustion. This temperature is then maintained for 15-20 minutes to ensure complete incineration of the particles within the DPF. The incineration process converts the carbon particles to carbon dioxide and water.

The active regeneration temperature of the DPF is closely monitored by the DPF software to maintain a target temperature of 600°C (1112°F) at the DPF inlet. The temperature control ensures that the temperatures do not exceed the operational limits of the turbocharger and the catalytic converter. The turbocharger inlet temperature must not exceed 830°C (1526°F) and the catalytic converter brick temperature must not exceed 800°C (1472°F) and the exit temperature must remain below 750°C (1382°F).

During the active regeneration process the following ECM controlled events occur:

- The turbocharger is maintained in the fully open position. This minimizes heat transmission from the exhaust gas to the turbocharger and reduces the rate of exhaust gas flow allowing optimum heating of the DPF. If the driver demands an increase in engine torque, the turbocharger will respond by closing the vanes as necessary.
- The throttle is closed as this assists in increasing the exhaust gas temperature and reduces the rate of exhaust gas flow which has the effect of reducing the time for the DPF to reach the optimum temperature.
- The Exhaust Gas Recirculation (EGR) valve is closed. The use of EGR decreases the exhaust gas temperature and therefore prevents the optimum DPF temperature being achieved.

If, due to vehicle usage and/or driving style, the active regeneration process cannot take place or is unable to regenerate the DPF, the dealer can force regenerate the DPF. This is achieved by either driving the vehicle until the engine is at its normal operating temperature and then driving for a further 20 minutes at speeds of not less than 30 mph (48 km/h) or by connecting a Land Rover approved diagnostic system to the vehicle which will guide the technician through an automated regeneration procedure to clean the DPF.

Diesel Particulate Filter Control

The DPF requires constant monitoring to ensure that it is operating at its optimum efficiency and does not become blocked. The ECM contains DPF software which controls the monitoring and operation of the DPF system and also monitors other vehicle data to determine regeneration periods and service intervals.

The DPF software can be divided into three separate control software modules; a DPF supervisor module, a DPF fuel management module and a DPF air management module.

These three modules are controlled by a fourth software module known as the DPF co-ordinator module. The co-ordinator module manages the operation of the other modules when an active regeneration is requested. The DPF supervisor module is a sub-system of the DPF co-ordinator module.

DPF Fuel Management Module

The DPF fuel management module controls the following functions:

- Timing and quantity of the four split injections per stroke (pilot, main and two post injections).
- Injection pressure and the transition between the three different calibration levels of injection.

The above functions are dependant on the condition of the catalytic converter and the DPF.

The controlled injection determines the required injection level in addition to measuring the activity of the catalytic converter and the DPF. The fuel management calculates the quantity and timing for the four split injections, for each of the three calibration levels for injection pressure, and also manages the transition between the levels.

The two post injections are required to separate the functionality of increasing in-cylinder gas temperatures and the production of hydrocarbons. The first post injection is used to generate the higher in-cylinder gas temperature while simultaneously retaining the same engine torque output produced during normal (non-regeneration) engine operation. The second post injection is used to generate hydrocarbons by allowing unburnt fuel into the catalytic converter without producing increased engine torque.

DPF Air Management Module

The DPF air management module controls the following functions:

- EGR control

- Turbocharger boost pressure control
- Intake air temperature and pressure control.

During active regeneration, the EGR operation is disabled and the closed-loop activation of the turbocharger boost controller is calculated. The air management module controls the air in the intake manifold to a predetermined level of pressure and temperature. This control is required to achieve the correct in-cylinder conditions for stable and robust combustion of the post injected fuel.

The module controls the intake air temperature by actuating the EGR throttle and by adjustment of the turbocharger boost pressure control.

DPF Co-ordinator Module

The DPF co-ordinator module reacts to a regeneration request from the supervisor module by initiating and co-ordinating the following DPF regeneration requests:

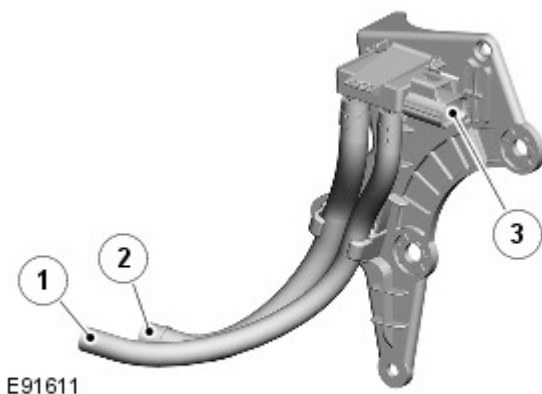
- EGR cut-off
- Turbocharger boost pressure control
- Engine load increase
- Control of air pressure and temperature in the intake manifold
- Fuel injection control.

When the supervisor module issues a regeneration request, the co-ordinator module requests EGR cut-off and a regeneration specific turbocharger boost pressure control. It then waits for a feedback signal from the EGR system confirming that the EGR valve is closed.

When the EGR valve is closed, the co-ordinator module initiates requests to increase engine load by controlling the intake air temperature and pressure.

Once confirmation is received that intake conditions are controlled or a calibration time has expired, the co-ordinator module then changes to a state awaiting an accelerator pedal release manoeuvre from the driver. If this occurs or a calibration time has expired, the co-ordinator module generates a request to control fuel injections to increase exhaust gas temperature.

Differential Pressure Sensor



Item	Part Number	Description
1	-	Low pressure connection
2	-	High pressure connection
3	-	Electrical connector

The differential pressure sensor is located on a bracket which is attached to the transfer case.

The differential pressure sensor is used by the DPF software to monitor the condition of the DPF. Two pipe connections on the sensor are connected by pipes to the inlet and outlet ends of the DPF. The pipes allow the sensor to measure the inlet and outlet pressures of the DPF

As the amount of particulates trapped by the DPF increases, the pressure at the inlet side of the DPF increases in comparison to the DPF outlet. The DPF software uses this comparison, in conjunction with other data, to calculate the accumulated amount of trapped particulates.

By measuring the pressure difference between the DPF inlet and outlet and the DPF temperature, the DPF software can determine if the DPF is becoming blocked and requires regeneration.

Differential Particulate Filter Temperature Sensors

Three temperature sensors are used in the DPF system. The first is located just after the turbocharger in the catalytic converter inlet pipe, the second located in the catalytic converter outlet pipe and the third in the DPF outlet cone pipe work.

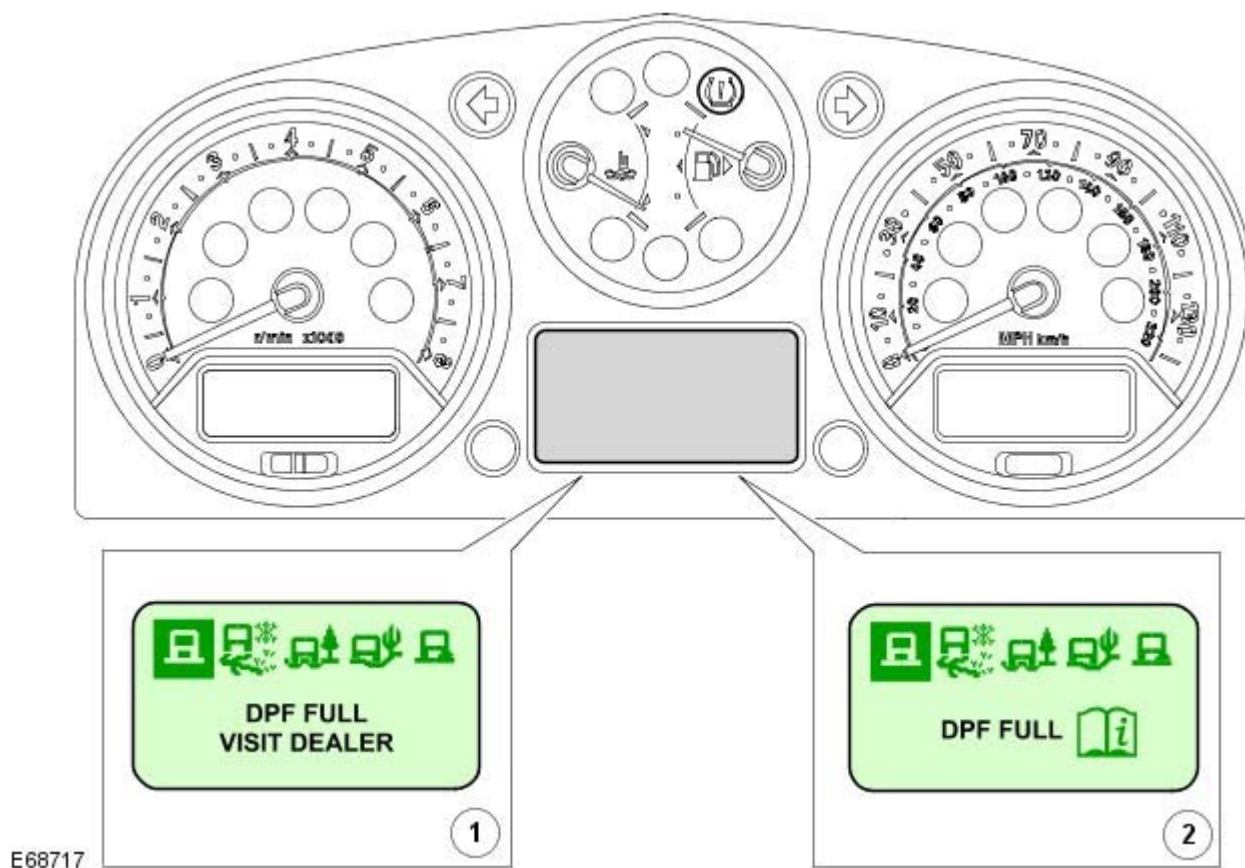
The sensors measure the temperature of exhaust gas exiting the turbocharger, after the catalyst and after it passes through the DPF to provide the information needed to calculate the DPF temperature.

The information is used, in conjunction with other data, to estimate the amount of accumulated particulates and to control

the DPF temperature.

Instrument Cluster Indications

For drivers who make regular short journeys at low speeds, it may not be possible to efficiently regenerate the DPF. In this case, the DPF software will detect a blockage of the DPF from signals from the differential pressure sensor and will alert the driver as follows.



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Item	Part Number	Description
1	-	'DPF FULL VISIT DEALER' message
2	-	'DPF FULL' message

Vehicles with DPF use a high-line instrument cluster to alert the driver to the condition of the DPF via messages in the message centre.

When the DPF becomes full the driver will be alerted to this condition by a message 'DPF FULL' accompanied by a handbook symbol. As detailed in the Owners Handbook, the driver should drive the vehicle until the engine is at its normal operating temperature and then drive for a further 20 minutes at speeds of not less than 30 mph (48 km/h). Successful regeneration of the DPF is indicated to the driver by the 'DPF FULL' message no longer being displayed.

If the DPF software detects that the DPF is still blocked, the message will change to 'DPF FULL VISIT DEALER', the driver should take the vehicle to an authorized dealer to have the DPF force regenerated.

Diesel Particulate Filter Side Effects

The following section details some side effects caused by the active regeneration process.

Engine Oil Dilution

Engine oil dilution can occur due to small amounts of fuel entering the engine crankcase during the post-injection phases. This has made it necessary to introduce a calculation based on driving style to reduce oil service intervals if necessary. The driver is alerted to the oil service by a message in the instrument cluster.

The DPF software monitors the driving style, the frequency of the active regeneration and duration. Using this information a calculation can be made on the engine oil dilution. When the DPF software calculates the engine oil dilution has reached a predetermined threshold (fuel being 7% of engine oil volume) a service message is displayed in the instrument cluster.

Depending on driving style, some vehicles may require an oil service before the designated interval. If an service message is displayed, the vehicle will be required have a full service and the service interval counter will be reset.

Fuel Consumption

During the active regeneration process of the DPF, there will be an increase in fuel consumption. However, because active regeneration occurs infrequently and for limited periods of time, the overall effect on fuel consumption is approximately 2%. The additional fuel used during the active regeneration process is accounted for in the instantaneous and average fuel consumption displays in the instrument cluster.

Exhaust System - TDV6 2.7L Diesel - Exhaust System

Diagnosis and Testing

Principle of Operation

For a detailed description of the exhaust system, refer to the relevant Description and Operation section of the workshop manual. REFER to: [Exhaust System](#) (309-00A Exhaust System - TDV6 2.7L Diesel, Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

- **NOTE:** Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> ● Leaks ● Metal fatigue ● Pipes ● Catalytic converter ● Muffler(s) ● Joints ● Mountings ● Clearance around components 	<ul style="list-style-type: none"> ● Fuses ● Wiring harness ● Electrical connector(s) ● Sensor(s) ● Engine Control Module (ECM)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Causes	Action
Noisy or leaking exhaust	<ul style="list-style-type: none"> ● Exhaust system/components 	Install new components as necessary. Refer to the relevant section of the workshop manual.
Lack of power	<ul style="list-style-type: none"> ● Air intake system fault ● Restricted exhaust system ● Low fuel pressure ● Exhaust Gas Recirculation (EGR) valve(s) fault ● Turbocharger fault 	Check the air intake system. Check for a blocked catalytic converter or muffler, install new components as necessary. Check the fuel pressure. For EGR and turbocharger tests, refer to the relevant section of the workshop manual.


DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.

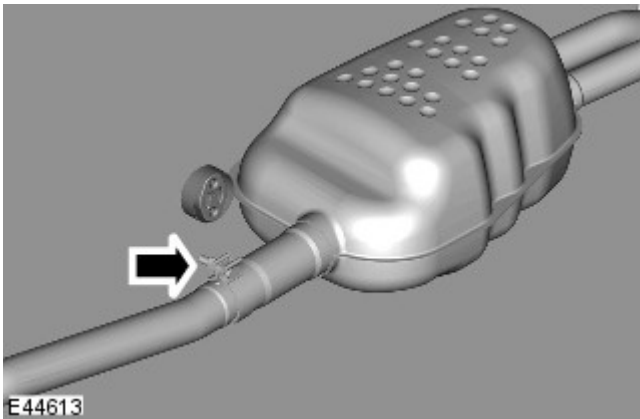
Exhaust System - TDV6 2.7L Diesel - Catalytic Converter Vehicles Without: Diesel Particulate Filter (DPF)

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: [Specifications](#) (414-00 Battery and Charging System - General Information, Specifications).
2.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.
3. Remove the exhaust system.
For additional information, refer to: [Exhaust System - Vehicles Without: Diesel Particulate Filter \(DPF\)](#) (309-00A Exhaust System - TDV6 2.7L Diesel, Removal and Installation).
4. Remove the catalytic converter.
 - Remove the nut and release the retaining clamp.



Installation

1. **NOTE:** Do not tighten the retaining clamp at this stage.

Position the catalytic converter to the front muffler.
 - Clean the components.
 - Install the nut.
2. Install the exhaust system.
For additional information, refer to: [Exhaust System - Vehicles Without: Diesel Particulate Filter \(DPF\)](#) (309-00A Exhaust System - TDV6 2.7L Diesel, Removal and Installation).
3. Tighten the catalytic converter retaining clamp to 55 Nm (40 lb.ft).
4. Connect the battery ground cable.
For additional information, refer to: [Specifications](#) (414-00 Battery and Charging System - General Information, Specifications).

Exhaust System - TDV6 2.7L Diesel - Catalytic Converter Vehicles With: Diesel Particulate Filter (DPF)

Removal and Installation

Removal

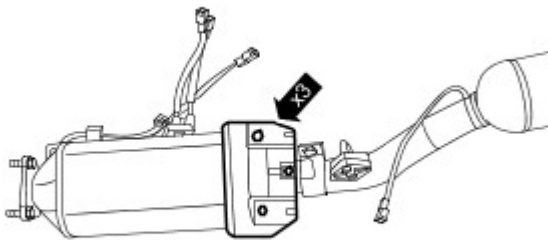


WARNING: Observe due care when working near a hot exhaust system.

- 1. WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

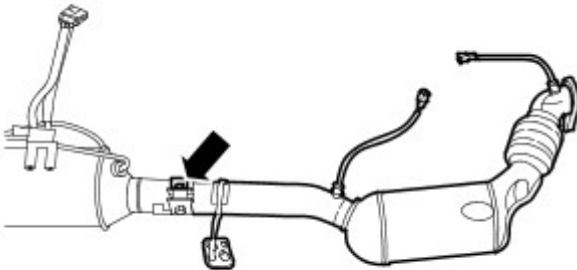
- 2. Remove the exhaust system.**
For additional information, refer to: [Exhaust System - Vehicles With: Diesel Particulate Filter \(DPF\)](#) (309-00A Exhaust System - TDV6 2.7L Diesel, Removal and Installation).
- 3. Remove the diesel particulate filter (DPF) heat shield.**
 - Remove the 3 bolts.



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- 4. Remove the catalytic converter.**

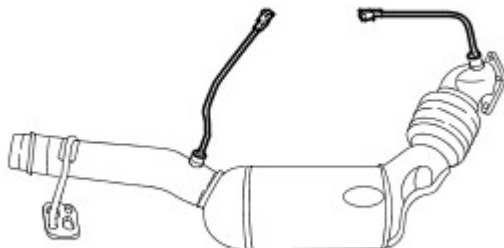
- Remove the nut.
- Remove and discard the clamp.



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- 5. NOTE:** Do not disassemble further if the component is removed for access only.

Remove the catalytic converter temperature sensors.




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Installation

- 1. Install the catalytic converter temperature sensors.**

- Tighten to 35 Nm (26 lb.ft).

2.  **CAUTION:** Make sure that the mating faces are clean and free of foreign material.

- **NOTE:** Do not fully tighten the clamp at this stage.

Install the catalytic converter.

- Install a new clamp.

3. Install the exhaust system.

For additional information, refer to: [Exhaust System - Vehicles With: Diesel Particulate Filter \(DPF\)](#) (309-00A Exhaust System - TDV6 2.7L Diesel, Removal and Installation).

4. Install the DPF heat shield.


- Tighten the 2 bolts to 10 Nm (7 lb.ft).

Exhaust System - TDV6 2.7L Diesel - Diesel Particulate Filter (DPF)

Removal and Installation

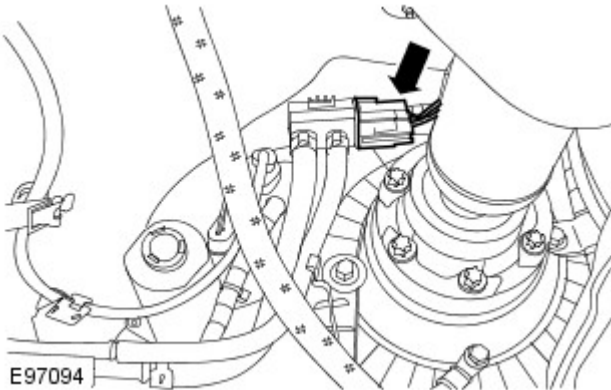
Removal

 **WARNING:** Observe due care when working near a hot exhaust system.

1.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

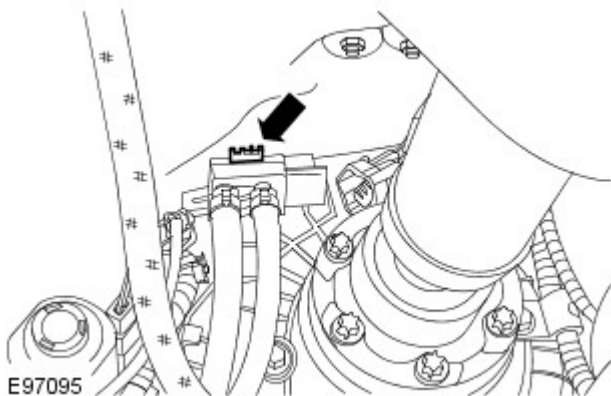
Raise and support the vehicle.

2. Disconnect the diesel particulate filter (DPF), differential pressure sensor electrical connector.

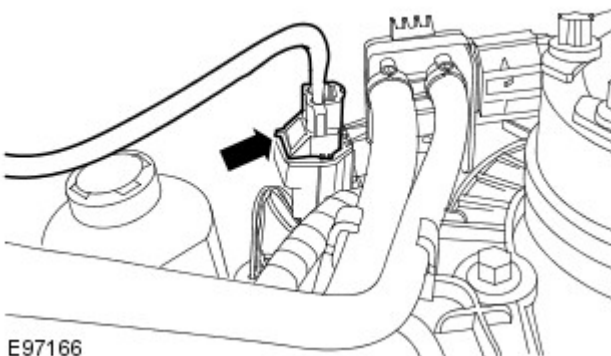



3. Release the DPF differential pressure sensor.

- Release the clip.

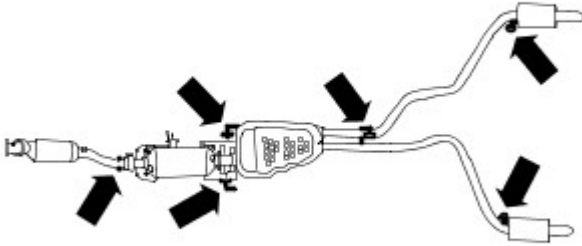


4. Disconnect the DPF exhaust gas temperature sensor electrical connector.



5.  CAUTION: Make sure that the exhaust system is supported with a suitable stand.

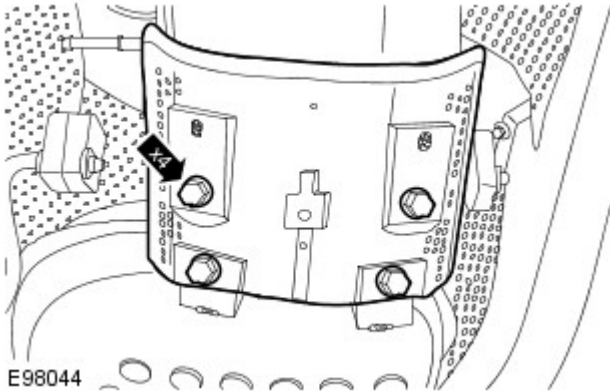
Release the 6 exhaust hangers.



E98050

6. Remove the DPF rear heat shield.

- Remove the 4 bolts.

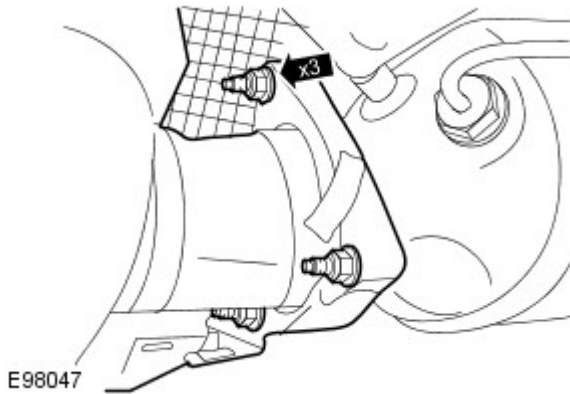


E98044

7. NOTE: Discard the gasket.

Reposition the muffler and tailpipe assembly.

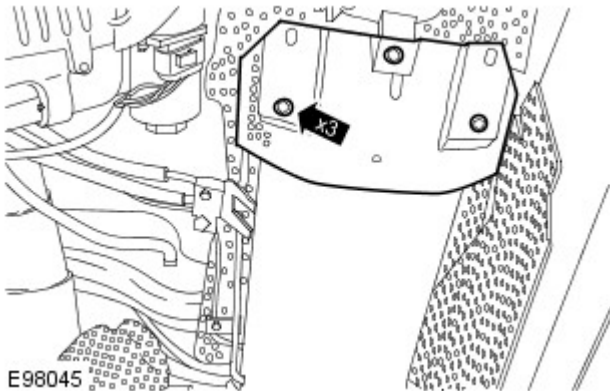
- Remove the 3 nuts.
- Remove the bracket.



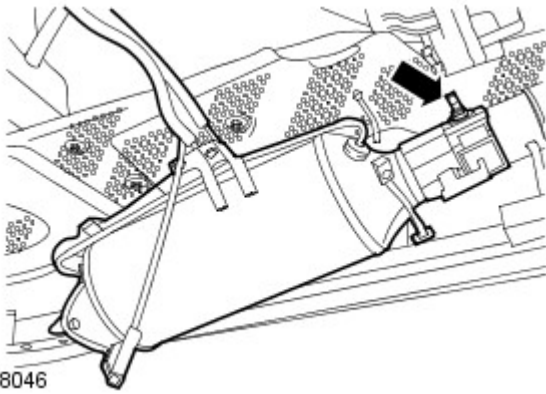
E98047

8. Remove the DPF front heat shield.

- Remove the 3 bolts.

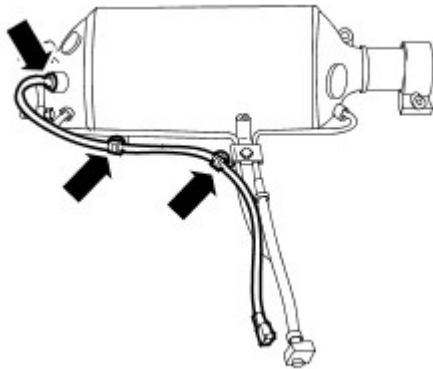


E98045



E98046

9. Remove the DPF.
 - Remove the nut.



E98049

10. **NOTE:** Do not disassemble further if the component is removed for access only.

Remove the DPF exhaust gas temperature sensor.

- Release the wiring harness from the 2 clips.

Installation


1. Install the DPF exhaust gas temperature sensor.
 - Tighten to 35 Nm (26 lb.ft).
 - Secure the wiring harness in the clips.
2. **NOTE:** Do not fully tighten the clamp at this stage.
Install the DPF.
3. **NOTE:** Install a new gasket.
Secure the muffler and tailpipe assembly.
 - Install the bracket.
 - Tighten the nuts to 48 Nm (35 lb.ft).
 - Secure the exhaust hangers.
4. Tighten the catalytic converter to DPF clamp.
 - Tighten the nut to 48 Nm (35 lb.ft).
5. Install the DPF heat shields.
 - Tighten the bolts to 10 Nm (7 lb.ft).
6. Secure the DPF differential pressure sensor.
7. Connect the DPF differential pressure sensor electrical connector.
8. Connect the DPF exhaust gas temperature sensor electrical connector.

Exhaust System - TDV6 2.7L Diesel - Diesel Particulate Filter (DPF) Differential Pressure Sensor

Removal and Installation

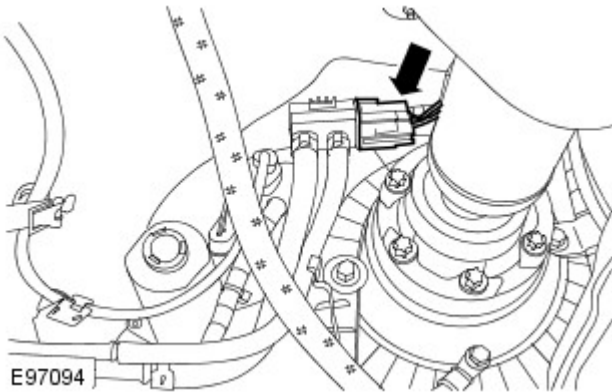
Removal

 **WARNING:** Observe due care when working near a hot exhaust system.

1.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

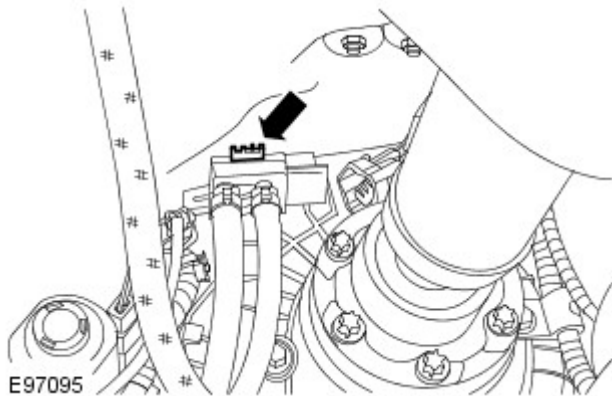
Raise and support the vehicle.


2. Disconnect the diesel particulate filter (DPF), differential pressure sensor electrical connector.



3. Release the DPF differential pressure sensor.

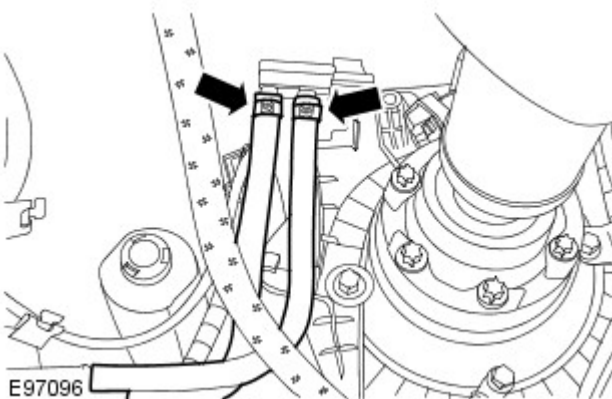
- Release the clip.



4.  **CAUTION:** Make a note of the connection orientation of the high and low pressure hoses to the sensor ports. Make sure the hoses are located to the correct sensor port when installed. Failure to follow these instructions may result in damage to the vehicle.

Disconnect the high and low pressure hoses from the DPF differential pressure sensor.

- Release the 2 clips.



Installation

1. Connect the high and low pressure hoses to the DPF differential pressure sensor.

- Secure the clips.

2. Secure the DPF differential pressure sensor.


- Secure with the clip.

3. Connect the DPF differential pressure sensor electrical connector.

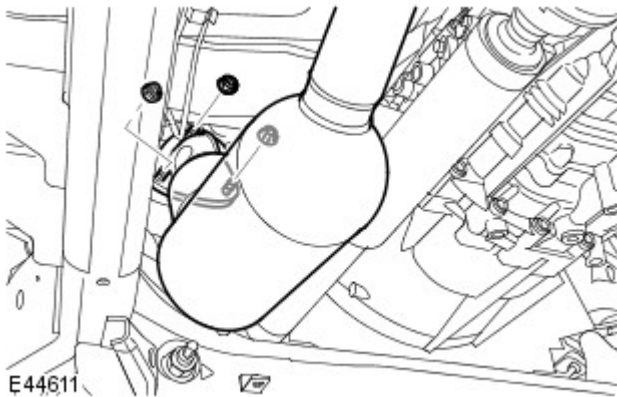
Exhaust System - TDV6 2.7L Diesel - Exhaust System Vehicles Without: Diesel Particulate Filter (DPF)

Removal and Installation

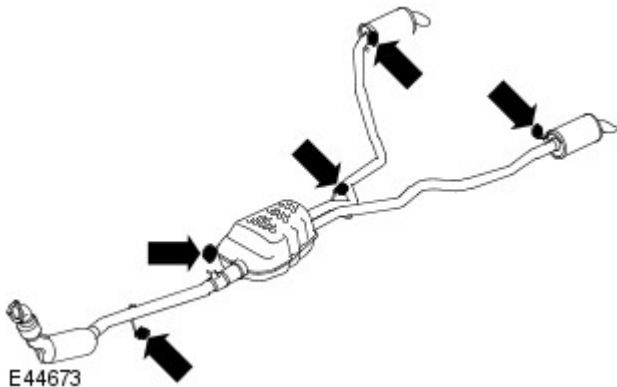
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: [Specifications](#) (414-00 Battery and Charging System - General Information, Specifications).
2.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.
3. Remove the engine undershield.
For additional information, refer to: [Engine Undershield](#) (501-02 Front End Body Panels, Removal and Installation).
4. Remove the transmission crossmember.
For additional information, refer to: [Transmission Support Crossmember - V8 5.0L Petrol](#) (502-02 Full Frame and Body Mounting, Removal and Installation).
5. Disconnect the catalytic converter from the exhaust manifold.
 - Remove the 3 nuts.
 - Discard the gasket.



6. With assistance, remove the exhaust system.
 - Disconnect the 5 exhaust hangers.



Installation

1. With assistance, install the exhaust system.
 - Attach the exhaust hangers.
2. Position the catalytic converter to the exhaust manifold.
 - Clean the components.
 - Install a new gasket.
 - Tighten the nuts to 48 Nm (35 lb.ft).
3. Install the transmission crossmember.
For additional information, refer to: [Transmission Support Crossmember - V8 5.0L Petrol](#) (502-02 Full Frame and Body

Mounting, Removal and Installation).

- 4.** Install the engine undershield.
For additional information, refer to: [Engine Undershield](#) (501-02 Front End Body Panels, Removal and Installation).
- 5.** Connect the battery ground cable.
For additional information, refer to: [Specifications](#) (414-00 Battery and Charging System - General Information, Specifications).

Exhaust System - TDV6 2.7L Diesel - Exhaust System Vehicles With: Diesel Particulate Filter (DPF)

Removal and Installation

Removal



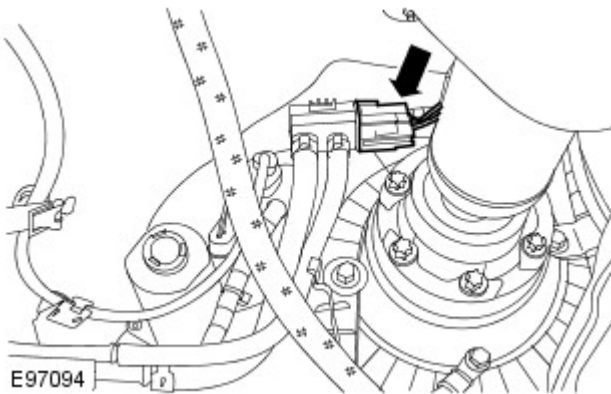
WARNING: Observe due care when working near a hot exhaust system.

- 1.** **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

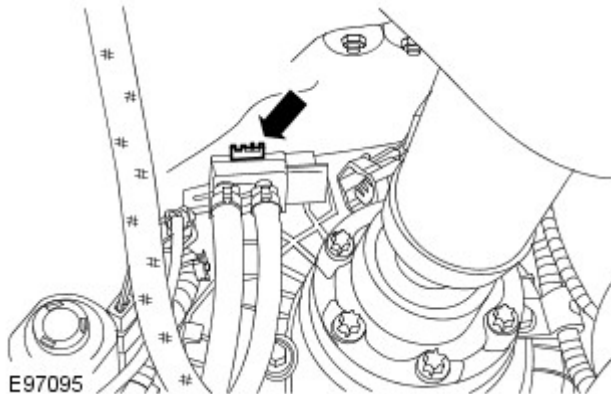
Raise and support the vehicle.

- 2.** Remove the transmission crossmember.
For additional information, refer to: [Transmission Support Crossmember - V8 5.0L Petrol](#) (502-02 Full Frame and Body Mounting, Removal and Installation).
- 3.** Disconnect the diesel particulate filter (DPF), differential pressure sensor electrical connector.

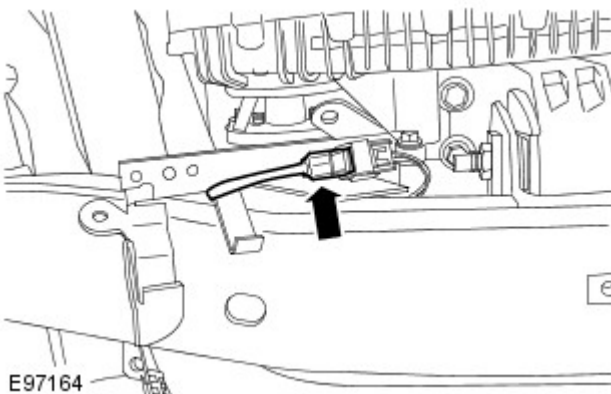
4.



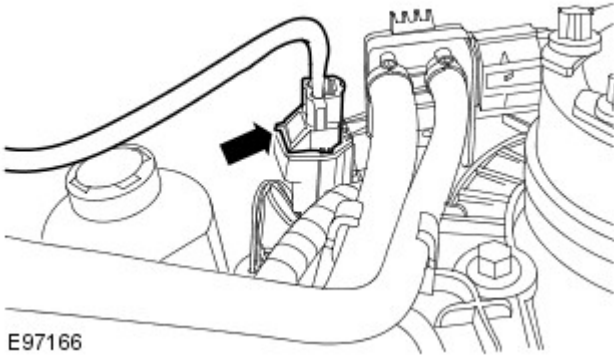
- 5.** Release the DPF differential pressure sensor.
 - Release the clip.



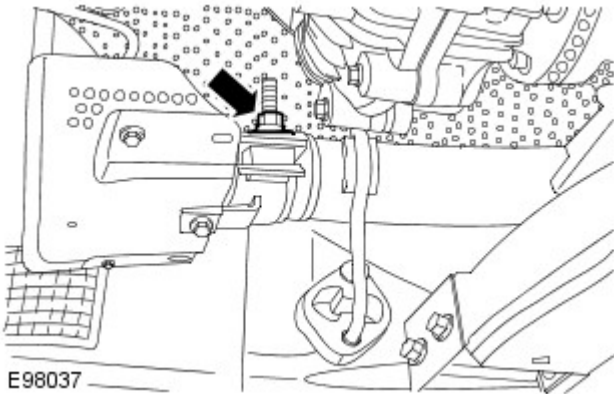
- 6.** Disconnect the post-catalytic converter exhaust gas temperature sensor electrical connector.
 - Release the 2 clips.



7. Disconnect the DPF exhaust gas temperature sensor electrical connector.



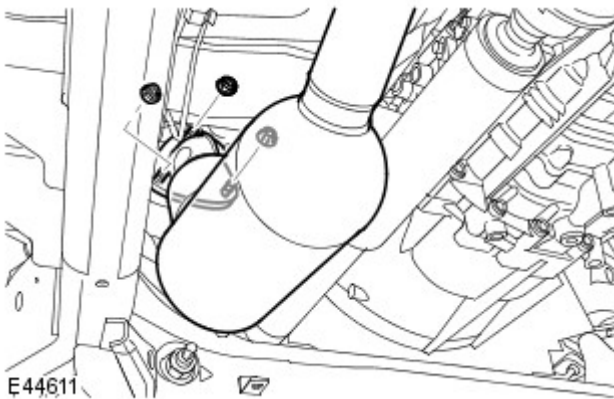
8. Loosen the catalytic converter to DPF clamp.



9. NOTE: Discard the gasket.

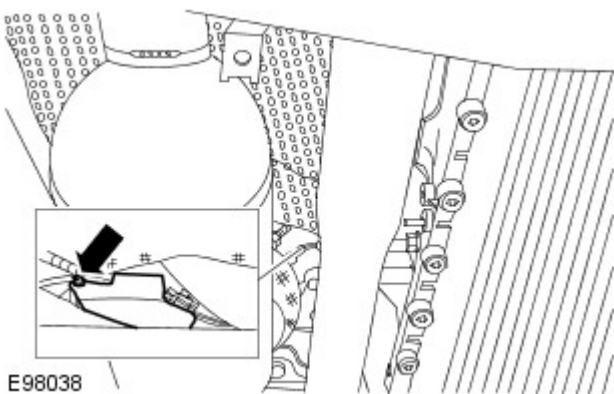
Release the catalytic converter from the turbocharger.

- Remove and discard the 3 nuts.

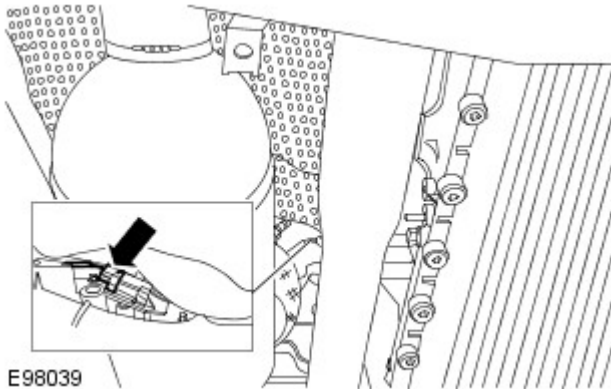


10. Remove the exhaust gas temperature sensor electrical connector heat shield.

- Remove the bolt.

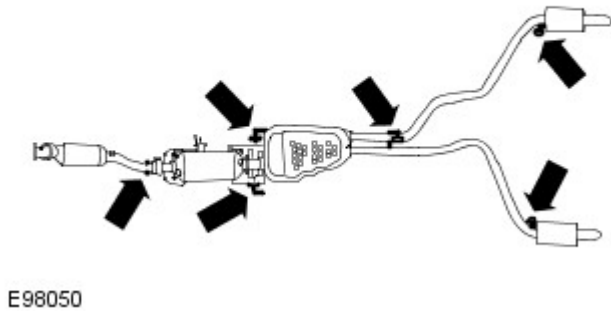


- 11.** Disconnect the pre-catalytic converter exhaust gas temperature sensor electrical connector.



- 12.** With assistance, remove the exhaust system.

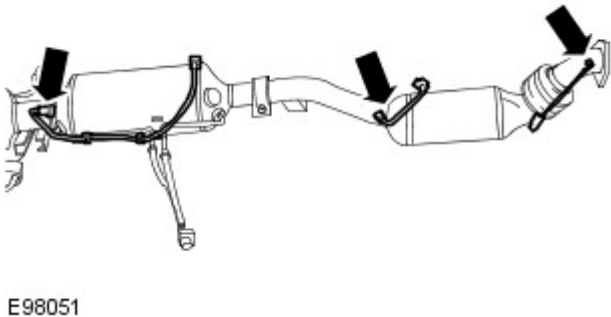
- Release the 6 exhaust hangers.



- 13.** NOTE: Do not disassemble further if the component is removed for access only.

- NOTE: Make a note of the fitted positions of the sensors before removal.

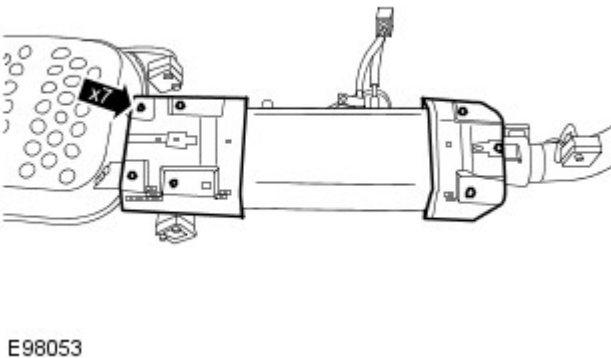
Remove the 3 exhaust gas temperature sensors.



- 14.** Remove the 6 exhaust hangers.


- 15.** Remove the 2 DPF heat shields.

- Remove the bolts.



Installation


- 1.** Install the 2 DPF heat shields.

- Tighten to 10 Nm (7 lb.ft).
2. Install the exhaust hangers.
 3. Install the exhaust gas temperature sensors.
 - Tighten to 35 Nm (26 lb.ft).
 4. With assistance, install the exhaust system.
 - Secure the exhaust hangers.
 5. Connect the pre-catalytic converter exhaust gas temperature sensor electrical connector.
 6. Install the exhaust gas temperature sensor electrical connector heat shield.
 - Tighten to 10 Nm (7 lb.ft).
 7.  **CAUTION:** Make sure that the mating faces are clean and free of corrosion and foreign material.
 - **NOTE:** Install a new gasket.
- Secure the catalytic converter to the turbocharger.
- Tighten the nuts to 48 Nm (35 lb.ft).
8. Secure the catalytic converter to DPF clamp.
 - Tighten to 48 Nm (35 lb.ft).
 9. Connect the DPF exhaust gas temperature sensor electrical connector.
 10. Connect the post-catalytic converter exhaust gas temperature sensor electrical connector.
 11. Secure the DPF differential pressure sensor.
 12. Connect the DPF differential pressure sensor electrical connector.
 13. Install the transmission crossmember.


For additional information, refer to: [Transmission Support Crossmember - V8 5.0L Petrol](#) (502-02 Full Frame and Body Mounting, Removal and Installation).

Exhaust System - TDV6 2.7L Diesel - Muffler Vehicles Without: Diesel Particulate Filter (DPF)

Removal and Installation

Special Tool(s)	
 <p>100-051</p> <p>E45589</p>	<p>Pipe cutter-exhaust 100-051 (LRT-99-027)</p>

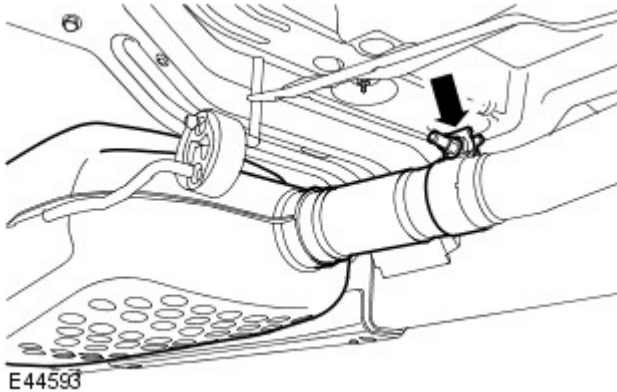
Removal

-  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

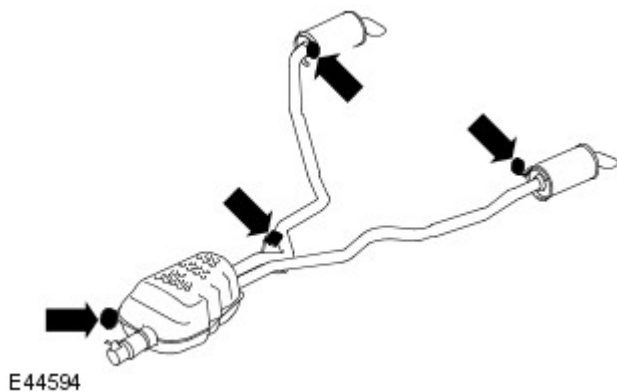
- Disconnect the catalytic converter from the muffler assembly.

- Remove the nut and release the retaining clamp.



- With assistance, remove the muffler assembly.

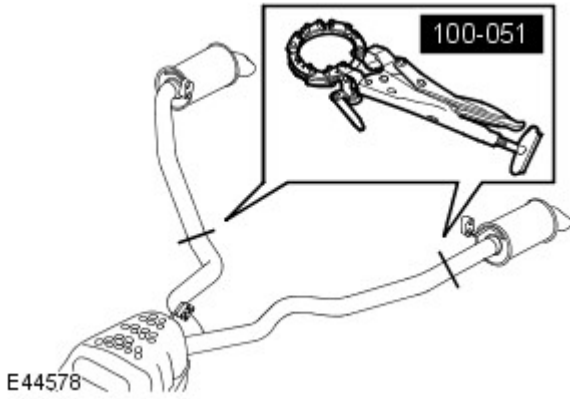
- Disconnect the 4 exhaust hangers.



- NOTE:** Do not disassemble further if the component is removed for access only.

Remove the LH tail pipe.

- Using 100-051, cut the tail pipe at the point indicated by a depression in the pipe.



5. Remove the RH tail pipe.

- Using 100-051, cut the tail pipe at the point indicated by a depression in the pipe.

Installation

1. NOTE: Do not tighten the retaining clamp at this stage.

Position the RH tail pipe to the muffler assembly.

- Clean the components.
- Install the retaining clamp.

2. NOTE: Do not tighten the retaining clamp at this stage.

Position the LH tail pipe to the muffler assembly.

- Clean the components.
- Install the retaining clamp.

3. With assistance, install the muffler assembly.

- Attach the exhaust hangers.
- Tighten the catalytic converter nuts and clamp to 48 Nm (35 lb.ft).


4. Align both tail pipes and tighten the retaining clamps to 55 Nm (40 lb.ft).

Exhaust System - TDV6 2.7L Diesel - Muffler Vehicles With: Diesel Particulate Filter (DPF)

Removal and Installation

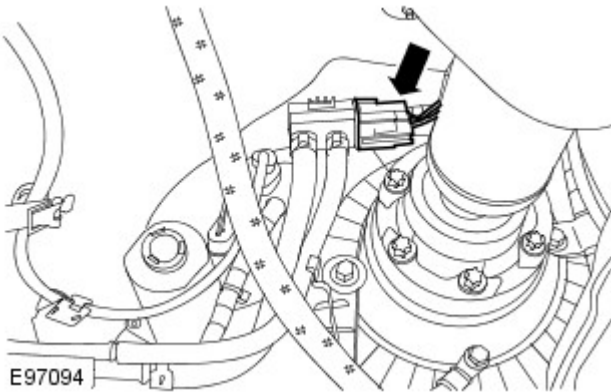
Removal

 **WARNING:** Observe due care when working near a hot exhaust system.

1.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

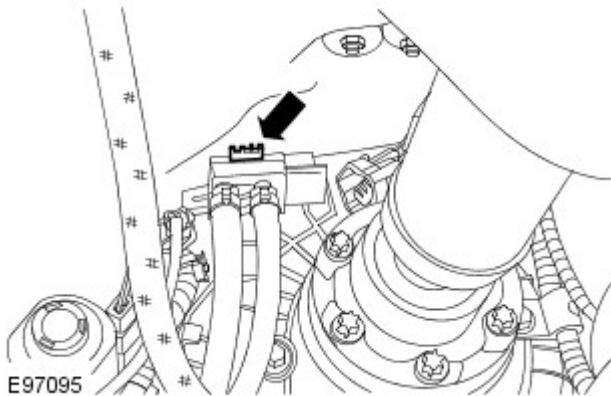
Raise and support the vehicle.

2. Disconnect the diesel particulate filter (DPF), differential pressure sensor electrical connector.

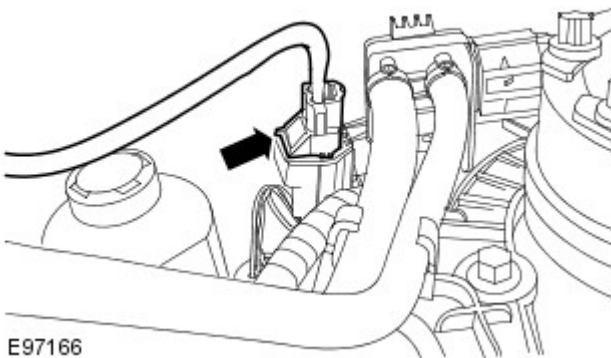



3. Release the DPF differential pressure sensor.

- Release the clip.

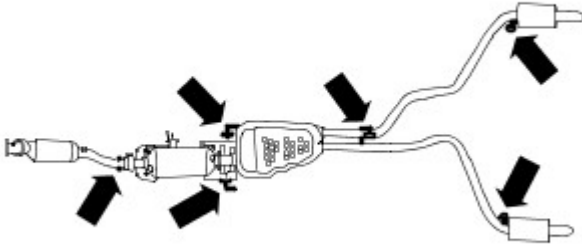


4. Disconnect the DPF exhaust gas temperature sensor electrical connector.



5.  CAUTION: Make sure that the exhaust system is supported with a suitable transmission stand.

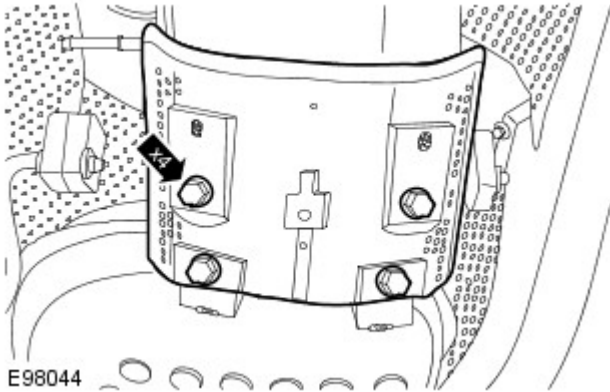
Release the 6 exhaust hangers.



E98050

6. Remove the DPF rear heat shield.

- Remove the 4 bolts.

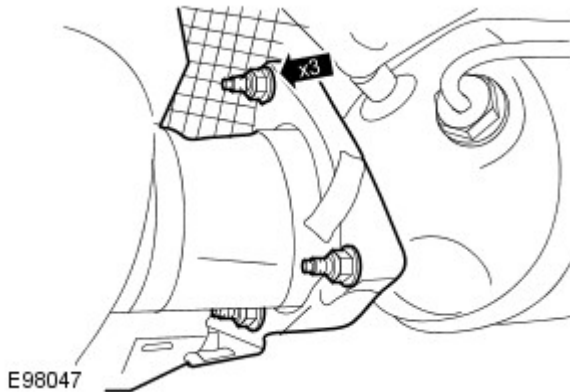


E98044

7. NOTE: Discard the gasket.

With assistance, remove the muffler and tailpipe assembly.

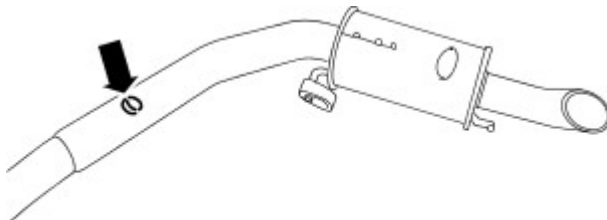
- Remove the 3 nuts.
- Remove the bracket.



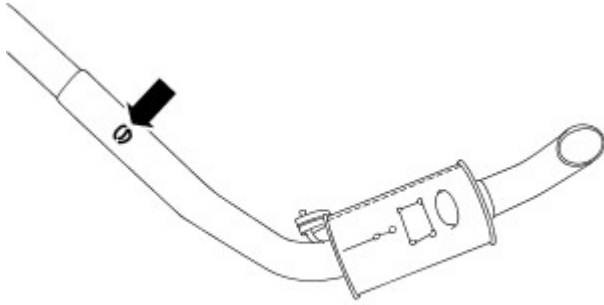
E98047

8. Remove the LH tail pipe.

- Using the special tool, cut the exhaust pipe at the marked position.



E87326



E87327

9. Remove the RH tail pipe.

- Using the special tool, cut the exhaust pipe at the marked position.

Installation

1. NOTE: Do not tighten the clamp at this stage.

Install the RH tail pipe to the muffler assembly.

- Clean the components.
- Install the clamp.

2. NOTE: Do not tighten the clamp at this stage.

Install the LH tail pipe to the muffler assembly.

- Clean the components.
- Install the clamp.

3. NOTE: Install a new gasket.

With assistance, install the muffler and tailpipe assembly.

- Install the bracket.
- Tighten the nuts to 48 Nm (35 lb.ft).
- Secure the exhaust hangers.

4. Align both of the tail pipes and tighten the clamps to 48 Nm (35 lb.ft).

5. Install the DPF rear heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).


6. Connect the DPF exhaust gas temperature sensor electrical connector.

7. Secure the DPF differential pressure sensor.


8. Connect the DPF differential pressure sensor electrical connector.

Exhaust System - TDV6 2.7L Diesel - Tailpipe

Removal and Installation

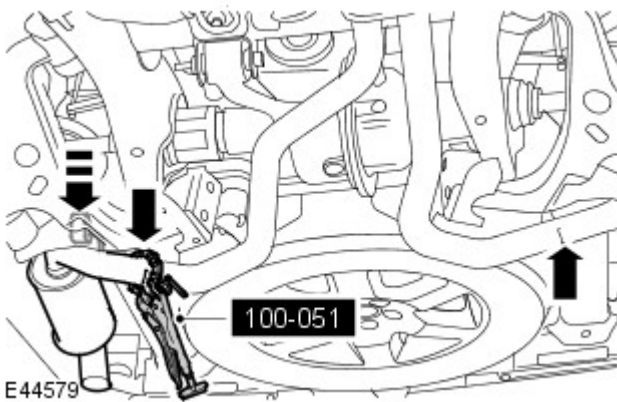
Special Tool(s)	
 <p>100-051</p> <p>E45589</p>	Pipe cutter-exhaust
	100-051 (LRT-99-027)

Removal

-  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

- Remove the tail pipe.
 - Using 100-051, cut the tail pipe at the point indicated by a depression in the pipe.
 - Disconnect from the exhaust hanger.



Installation

- NOTE:** Do not tighten the retaining clamp at this stage.

Install the tail pipe.

- Clean the components.
- Install the retaining clamp.

- Align the tail pipe and tighten the retaining clamp to 55 Nm (40 lb.ft).

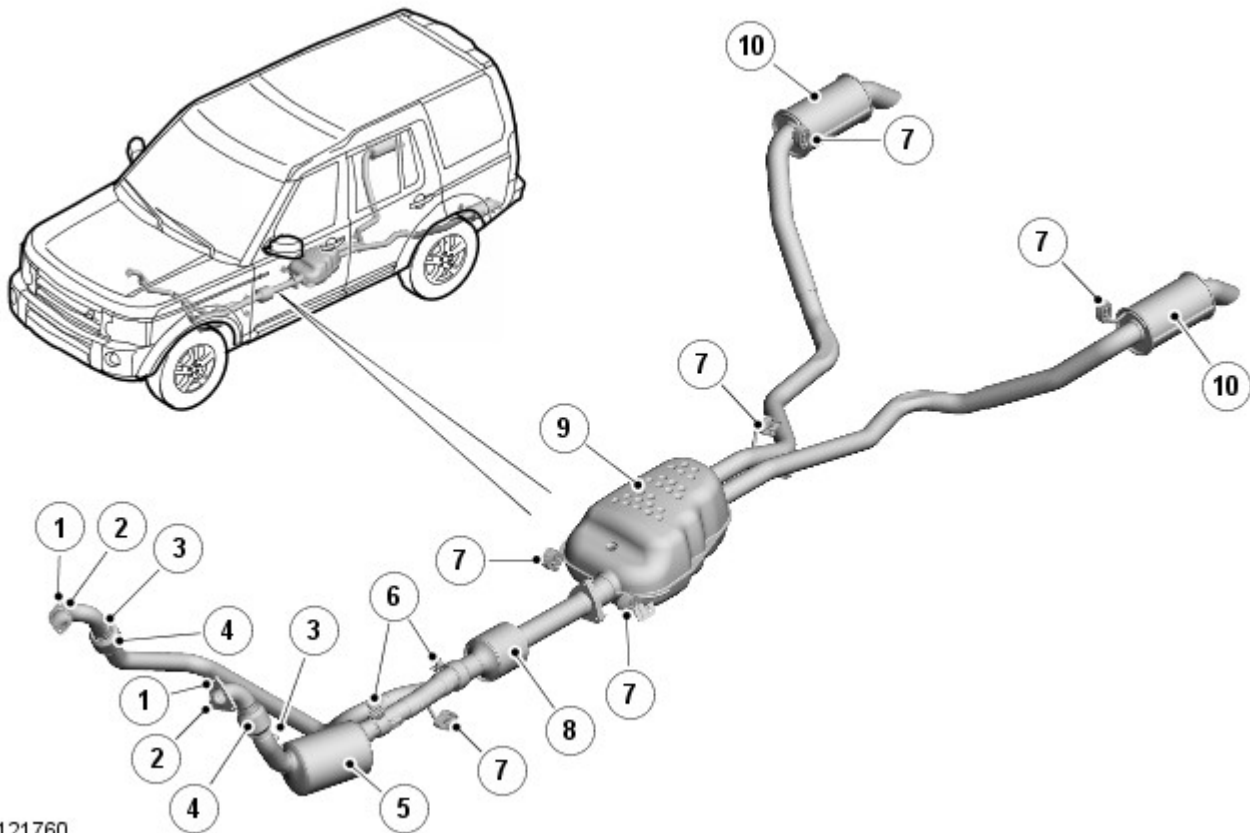
Exhaust System - TDV6 3.0L Diesel -

Description	Nm	lb-ft	lb -in
Turbocharger to catalytic converter retaining bolts	28	21	-
Catalytic converter clamp without diesel particulate filter (DPF)	48	35	-
Catalytic converter clamp with DPF	48	35	-
DPF to front muffler securing strap nuts	23	17	-
Catalytic converter temperature sensors	35	26	-
DPF temperature sensor	35	26	-
Heated oxygen sensor (HO2S)	48	35	-
DPF heat shield retaining bolts	10	7	-
Service clamp	48	35	-

Exhaust System - TDV6 3.0L Diesel - Exhaust System

Description and Operation

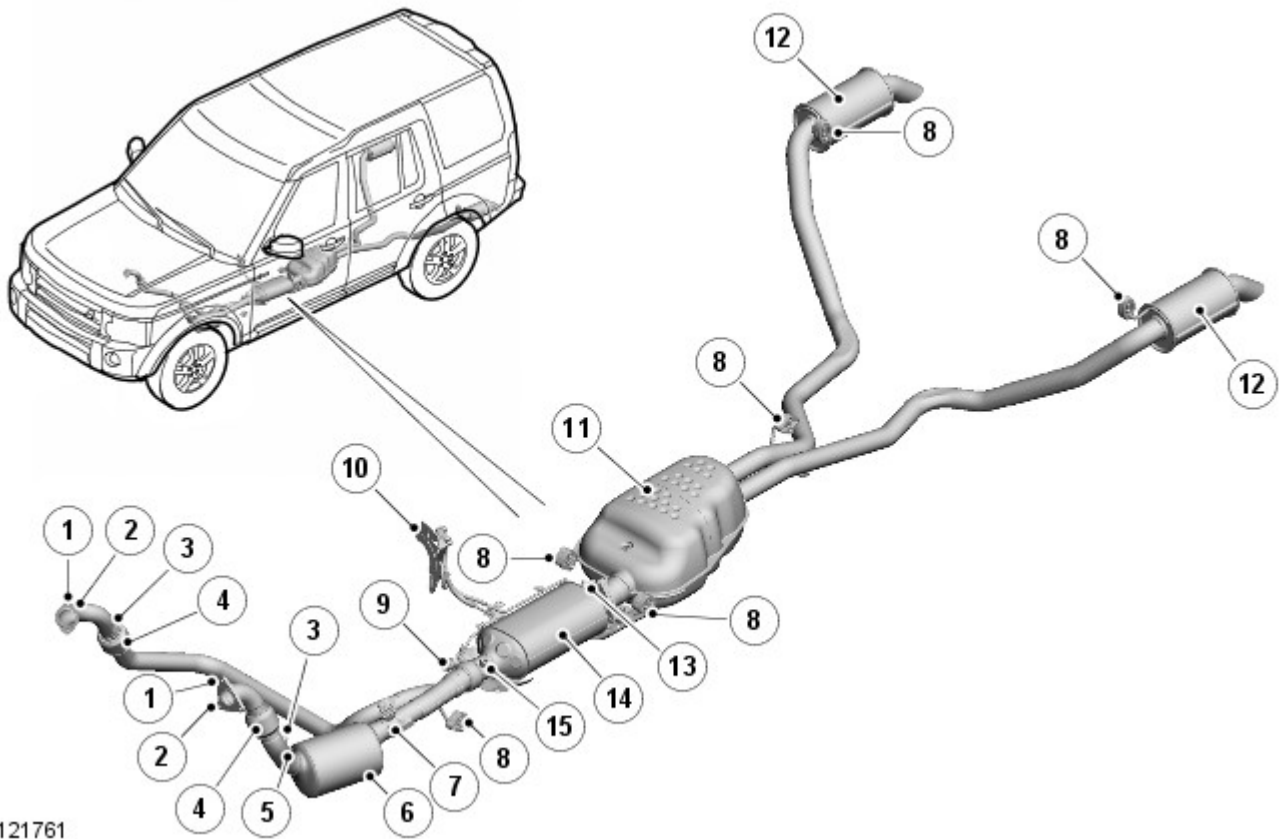
3.0L TdV6 EXHAUST SYSTEM COMPONENT LOCATION - WITHOUT DIESEL PARTICULATE FILTER



E121760

Item	Part Number	Description
1	-	Bolt (5 off)
2	-	Gasket
3	-	Flexible coupling
4	-	Heated Oxygen Sensor (HO2S) mounting boss
5	-	Catalytic converter
6	-	Clamp
7	-	Mounting rubber (6 off)
8	-	Catalytic converter
9	-	Silencer - Center
10	-	Silencer - Rear

3.0L TdV6 EXHAUST SYSTEM COMPONENT LOCATION - WITH DIESEL PARTICULATE FILTER (IF FITTED)



E121761

Item	Part Number	Description
1	-	Bolt (5 off)
2	-	Gasket
3	-	Temperature sensor mounting boss
4	-	Flexible coupling
5	-	HO2S mounting boss
6	-	Catalytic converter
7	-	Clamp
8	-	Mounting rubber (6 off)
9	-	Clamp
10	-	Differential pressure sensor
11	-	Silencer - Center
12	-	Silencer - Rear
13	-	Temperature sensor mounting boss
14	-	Diesel Particulate Filter (DPF)
15	-	Temperature sensor mounting boss

OVERVIEW

The 3.0L V6 TdV6 exhaust system is fabricated from stainless steel and is supplied as four separate assemblies; 2 front sections, one incorporating a catalytic converter, a connecting section or Diesel Particulate Filter (DPF) and a rear section incorporating a centre silencer and two rear silencers.

The system is attached to the underside of the body with 6 mounting rubbers which are located on mild steel hanger bars that are welded to the system. The mounting rubbers locate on corresponding hangers which are welded to the underside of the vehicle body.

The system has service repair items available. Indentations in the rear section between the center and the rear silencers show the cut points for the service replacement rear silencers or front section. When a service repair section is used, the joint is connected using a sleeve and two clamps to connect the pipes at the cut points.

Two variants of the exhaust system are available; a non DPF system and a system incorporating a DPF. The DPF is required to comply with EU5 emission regulations



CAUTION: The use of bio-fuels can seriously contaminate and destroy the coatings used on the catalytic converter. The DPF and the catalytic converter can become irreversibly contaminated if non-specified oils or fuels are used. This will result in the vehicle being unable to regenerate the DPF, becoming non-compliant with tailpipe emission regulations and replacement of the catalytic converter and DPF will be required.

If the vehicle is waded in deep water and the engine is stopped with the tailpipes submerged, the water, which can enter the system, can also contaminate both the DPF and the catalytic converter. This again can result in catalytic converter damage and damaging the ability for the DPF to regenerate therefore requiring both components to be replaced.

DESCRIPTION

FRONT SECTION

The front section comprises 1 catalytic converter for the LH (left-hand) bank of cylinders. The catalytic converter has a welded inlet pipe which is curved through 90 degrees. The RH (right-hand) bank also has a curved inlet pipe which connects to a pipe to the DPF (if fitted) or catalytic converter assembly (vehicles without DPF).

The outer end of each inlet pipe is fitted with a flange which mates with the turbocharger for each bank of cylinders. Three bolts in the LH flange and two bolts in the RH flange locate in threaded holes in the mating flange on the turbocharger. Each flange is sealed with a gasket. The inlet pipes are 55 mm (2.16 in) diameter and are fitted with a flexible coupling.

The base of the catalytic converter has a connection with the LH bank outlet pipe and is secured with a clamp. The outlet connection from the LH bank catalytic converter and the outlet connection from the RH bank, merge into one single pipe which then connects to the DPF (if fitted) or catalytic converter assembly (vehicles without DPF).

The DPF (if fitted) or catalytic converter assembly (vehicles without DPF) is connected at its rearward end to the center silencer with a flange connection with the rear exhaust section. Three studs in the DPF (if fitted) or catalytic converter assembly (vehicles without DPF) mate with the center silencer rear section flange and are secured with 3 nuts and sealed with a gasket.

REAR SECTION

The centre silencer comprises two pressed stainless steel shells which are welded together to give a capacity of 25.2 liters (1537 in³). The silencer contains baffles and perforated tubes which reduce noise as the exhaust gases pass through the silencer.

Hanger bars are welded to the front right hand side and left hand side of the silencer and provide for the location of mounting rubbers. The silencer has two 60 mm (2.3 in) diameter outlet pipes, with a 1.5 mm (0.06 in) wall thickness, which are curved to pass around the rear suspension components. Each outlet pipe terminates in a welded joint with the rear silencers. The outlet pipes have a hanger bar which provides for the location of a mounting rubber. A hanger bar is welded to the front face of each rear silencer and provides for the location of a mounting rubber.

The silencer is a circular fabrication with a baffle tube which is surrounded with glass fiber to provide further noise suppression. Each silencer has a capacity of 2.7 liters (165 in³). The silencers each have an outlet pipe which is 65 mm (2.55 in) diameter, with a wall thickness of 1.2 mm (0.05 in). Each outlet pipe is curved downwards to direct exhaust gasses away from the rear of the vehicle.

CATALYTIC CONVERTER

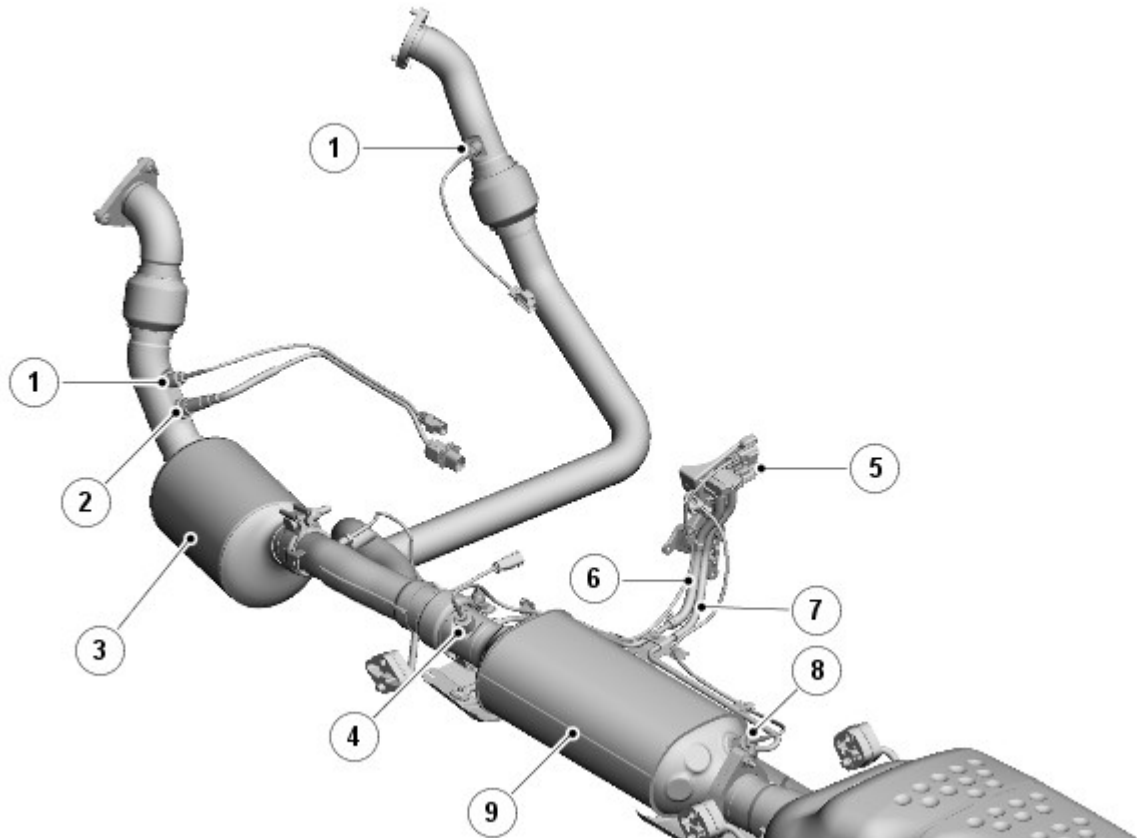
The oxidizing catalytic converter is fitted in the front section of the LH bank outlet pipe from the turbocharger, after the pre-catalyst exhaust gas temperature sensor (vehicles with DPF only) and the Heated Oxygen Sensor (HO₂S).

- **NOTE:** On vehicles fitted with a DPF: The pre and post catalyst exhaust gas temperature sensors are used by the engine management system to monitor the DPF for regeneration purposes.

On vehicles without a DPF, a second smaller catalytic converter is fitted in place of the DPF to further improve emissions.

The engine management system provides accurately metered quantities of fuel to the combustion chambers to ensure the most efficient use of fuel and to minimise the exhaust emissions. To further reduce the carbon monoxide and hydrocarbons content of the exhaust gases, a catalytic converter is integrated into the LH bank front pipe of the exhaust system. In the catalytic converter the exhaust gases are passed through honeycombed ceramic elements coated with a special surface treatment called 'washcoat'. The washcoat increases the surface area of the ceramic elements by a factor of approximately 7000. On top of the washcoat is a coating containing platinum and palladium, which are the active constituents for converting harmful emissions into inert by-products. The platinum and palladium add oxygen to the carbon monoxide and the hydrocarbons in the exhaust gases, to convert them into carbon dioxide and water respectively.

DIESEL PARTICULATE FILTER (DPF)



E121762

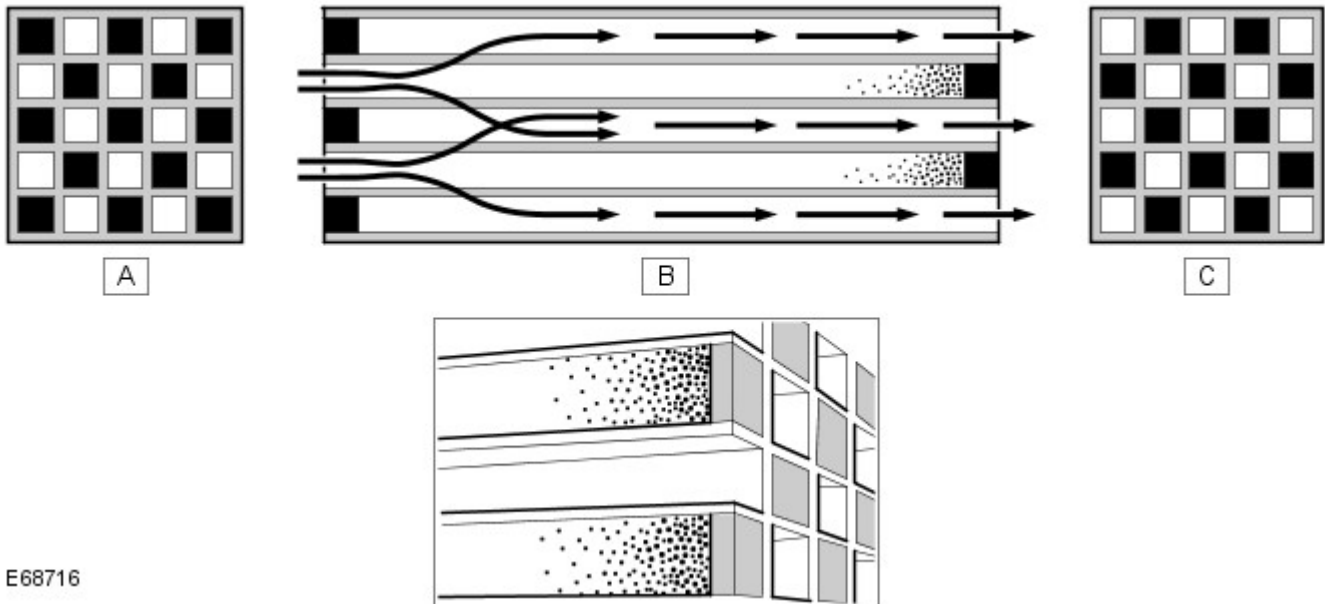
Item	Part Number	Description
1	-	Exhaust gas temperature sensor (2 off)
2	-	HO2S
3	-	Catalytic converter
4	-	Pre DPF temperature sensor
5	-	Differential pressure sensor
6	-	High pressure pipe
7	-	Low pressure pipe
8	-	Post DPF temperature sensor
9	-	DPF

The DPF system reduces diesel particulate emissions to negligible levels to meet European Stage 5 emission standards. The particulate emissions are the black fumes emitted from the diesel engine under certain load conditions. The emissions are a complex mixture of solid and liquid components with the majority of the particulates being carbon microspheres on which hydrocarbons from the engine's fuel and lubricant condense.

The DPF is located in the exhaust system, downstream of the catalytic converters. A major feature of the DPF is its ability for to trap carbon particles before they are emitted to the atmosphere and then to oxidize the carbon at an opportune time. Regeneration is the oxidation of particulates trapped by the filter. The regeneration process takes place at calculated intervals and is not noticeable by the driver of the vehicle. Regeneration is most important, since an overfilled filter can damage the engine through excessive exhaust back pressure and can itself be damaged. The material trapped in the filter is in the most part carbon particles with some absorbed hydrocarbons.

The DPF system comprises the following components:

- • Diesel particulate filter (silicone carbide ceramic)
- • DPF control software incorporated into the Engine Control Module (ECM)
- • Exhaust gas temperature sensors
- • Differential pressure sensor.



E68716

Item	Part Number	Description
A	-	A. Front face showing alternate closed cells
B	-	B. Side view showing exhaust gas flow through the filter and particulate build up
C	-	C. Rear face showing alternate closed cells

The DPF uses a technology based on a filter with a catalytic coating. The DPF is made from silicon carbide housed in a steel container and has excellent thermal shock resistance and thermal conductivity properties. The DPF is designed for the engine's operating requirements to maintain the optimum back pressure requirements.

The porous surface of the filter consists of a number of small parallel channels positioned in the longitudinal direction of the exhaust system. Adjacent channels in the filter are alternately plugged at the end. This design forces the exhaust gasses to flow through the porous walls, which act as the filter medium. Particulate matter which are too big to pass through the porous surface are collected and stored in the channels.

The collected particulate matter, if not removed, can create an obstruction to exhaust gas flow. The particles are removed by a regeneration process which oxidizes the particles.

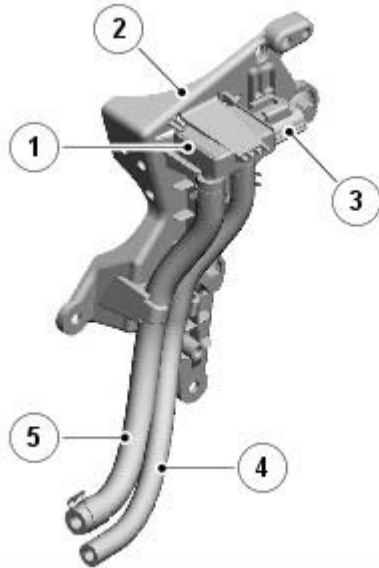
DPF regeneration is controlled by the temperature of the exhaust gasses and the DPF. The DPF includes a wash coat to the filter surface which comprises platinum and other active components and is similar to the catalytic converter. At certain exhaust gas and DPF temperatures the assembly promotes oxidation of the particles in addition to oxidizing carbon monoxide and hydrocarbon emissions.

The exhaust gas and DPF temperatures are controlled by the DPF software located in the ECM. The DPF software monitors the load status of the DPF based on driving style, distance travelled and signals from the differential pressure sensor and temperature sensors. When the particulate loading of the DPF reaches predetermined levels, the DPF is actively regenerated by adjusting, in conjunction with the ECM, various engine control functions such as:

- • fuel injection
- • intake air throttle
- • exhaust gas recirculation
- • turbocharger boost pressure control.

The regeneration process is possible because of the flexibility of the common-rail fuel injection engine which provides precise control of fuel flow, fuel pressure and injection timing which are essential requirements to promote the efficient regeneration process.

Differential Pressure Sensor



E 121763

Item	Part Number	Description
1	-	Differential pressure sensor
2	-	Bracket (attached to transfer box)
3	-	Electrical connector
4	-	Low pressure pipe
5	-	High pressure pipe

The differential pressure sensor is located on a bracket which is attached to the transfer case.

The differential pressure sensor is used by the DPF software to monitor the condition of the DPF. Two pipe connections on the sensor are connected by pipes to the inlet and outlet ends of the DPF. The pipes allow the sensor to measure the inlet (high) and outlet (low) pressures of the DPF

As the amount of particulates trapped by the DPF increases, the pressure at the inlet side of the DPF increases in comparison to the DPF outlet. The DPF software uses this comparison, in conjunction with other data, to calculate the accumulated amount of trapped particulates.

By measuring the pressure difference between the DPF inlet and outlet and the DPF temperature, the DPF software can determine if the DPF is becoming blocked and requires regeneration.

Diesel Particulate Filter Temperature Sensors

Four temperature sensors are used in the DPF system. Two temperature sensors are located in the inlet pipes from each cylinder bank, just before the flexible couplings. A third is located in the inlet pipe to the DPF and the fourth sensor is located in the DPF outlet pipe to the center silencer.

The sensors measure the temperature of exhaust gas leaving the turbochargers, the temperature of the exhaust gas before it passes through the DPF and the temperature of the exhaust gas exiting the DPF. The 4 sensors provide the information needed to calculate the DPF temperature.

The information is used, in conjunction with other data, to estimate the amount of accumulated particulates and to control the DPF temperature.

Instrument Cluster Indications

For drivers who make regular short journeys at low speeds, it may not be possible to efficiently regenerate the DPF. This condition will be detected by the DPF software and will alert the driver as follows:

When the DPF becomes full the driver will be alerted to this condition by a message 'DPF FULL' accompanied by a handbook symbol. As detailed in the Owners Handbook, the driver should drive the vehicle until the engine is at its normal operating temperature and then drive for a further 20 minutes at speeds of between 45 and 70 mph (72 and 112 km/h). Successful regeneration of the DPF is indicated to the driver by the 'DPF FULL' message no longer being displayed. It should be noted that this condition is not a fault in the hardware. The message is intended to provide feedback to the driver that the current driving style may not be optimal for DPF regeneration and that high oil dilution may occur (refer to the following section 'Engine Oil Dilution').

A further DPF loading state may occur in which the DPF software detects that the DPF is still blocked, the message will change to 'DPF FULL VISIT DEALER', the driver should take the vehicle to an authorized dealer to have the DPF force regenerated. This message may imply that the DPF requires replacement - refer to service documentation for service regeneration options before replacing the DPF.

DIESEL PARTICULATE FILTER - SIDE EFFECTS

The following section details some side effects caused by the active regeneration process.

Engine Oil Dilution

Engine oil dilution can occur due to small amounts of fuel entering the engine crankcase during the post-injection phases. This has made it necessary to introduce a calculation based on driving style to reduce oil service intervals if necessary.

The driver is alerted to the oil service by a message in the instrument cluster.

The DPF software monitors the driving style, the frequency of the active regeneration and duration. Using this information a calculation can be made on the engine oil dilution. When the DPF software calculates the engine oil dilution has reached a predetermined threshold (fuel being 7% of engine oil volume) a service message is displayed in the instrument cluster.

Depending on driving style, some vehicles may require an oil service before the designated interval. If an service message is displayed, the vehicle will be required to have a full service and the service interval counter will need to be reset.

Fuel Consumption

During the active regeneration process of the DPF, there will be an increase in fuel consumption. However, because active regeneration occurs infrequently and for limited periods of time, the overall effect on fuel consumption is less than 1%. The additional fuel used during the active regeneration process is accounted for in the instantaneous (where applicable) and average fuel consumption displays in the instrument cluster.

OPERATION

Passive Regeneration

Passive regeneration requires no special engine management intervention and occurs during normal engine operation. The passive regeneration involves a slow conversion of the particulate matter deposited in the DPF into carbon dioxide. This process is active when the DPF temperature reaches 250°C (482°F) and is a continuous process when the vehicle is being driven at higher engine loads and speeds.

During passive regeneration, the oxidation rate is low. This is due to the chemical reaction process and is only effective within the normal operating temperature range of 250°C to 500°C (482°F to 932°F).

Above this temperature range the conversion efficiency of the particulates into carbon dioxide increases as the DPF temperature is raised. These temperatures can normally be achieved using the active regeneration process.

Active Regeneration

Active regeneration starts when the particulate loading of the DPF reaches a threshold as monitored or determined by the DPF control software. The threshold calculation is based on driving style, distance travelled and back pressure signals from the differential pressure sensor.

Active regeneration generally occurs every 450 miles (725 km) although this is highly dependant on how the vehicle is driven. For example, if the vehicle is driven at low loads in urban traffic regularly, active regeneration will occur more often. This is due to the rapid build-up of particulates in the DPF than if the vehicle is driven at high speeds when passive regeneration will have occurred.

The DPF software incorporates a mileage trigger which is used as back-up for active regeneration. If active regeneration has not been initiated by a back pressure signal from the differential pressure sensor, regeneration is requested based on distance traveled.

Active regeneration of the DPF is commenced when the temperature of the DPF is increased to the oxidation temperature of the particles. The DPF temperature is raised by increasing the exhaust gas temperature. This is achieved by introducing post-injection of fuel after the pilot and main fuel injections have occurred.

This is determined by the DPF software monitoring the signals from the two DPF temperature sensors to establish the temperature of the DPF. Depending on the DPF temperature, the DPF software requests the ECM to perform either one or two post-injections of fuel:

- • The first post-injection of fuel retards combustion inside the cylinder which increases the temperature of the exhaust gas
- • The second post-injection of fuel is injected late in the power stroke cycle. The fuel partly combusts in the cylinder, but some unburnt fuel also passes into the exhaust where it creates an exothermic event within the catalytic converter, further increasing the temperature of the DPF.

The active regeneration process takes approximately 20 minutes to complete. The first phase increases the DPF temperature to 500°C (932°F). The second phase further increases the DPF temperature to 600°C (1112°F) which is the optimum temperature for particle combustion. This temperature is then maintained for 15-20 minutes to ensure complete oxidation of the particles within the DPF. The process converts the carbon particles to carbon dioxide and water.

The active regeneration temperature of the DPF is closely monitored by the DPF software to maintain a target temperature of 600°C (1112°F) at the DPF inlet. The temperature control ensures that the temperatures do not exceed the operational limits of the turbocharger and the catalytic converter. The turbocharger inlet temperature must not exceed 830°C (1526°F) and the catalytic converter brick temperature must not exceed 800°C (1472°F) and the exit temperature must remain below 750°C (1382°F).

During the active regeneration process the following ECM controlled events occur:

- • The turbocharger is adjusted to reduce boost pressure. This minimizes heat transmission from the exhaust gas to the turbocharger and reduces the rate of exhaust gas flow allowing optimum heating of the DPF. If the driver demands an increase in engine torque, the turbocharger will respond by closing the vanes as necessary
- • The intake throttle is adjusted as this assists in increasing the exhaust gas temperature and reduces the rate of exhaust gas flow which has the effect of reducing the time for the DPF to reach the optimum temperature
- • The Exhaust Gas Recirculation (EGR) valve is closed. The use of EGR decreases the exhaust gas temperature and therefore prevents the optimum DPF temperature being achieved.

If, due to vehicle usage and/or driving style, the active regeneration process cannot take place or is unable to regenerate the DPF, the dealer can force regenerate the DPF. This is achieved by either driving the vehicle until the engine is at its normal operating temperature and then driving for a further 20 minutes at speeds of between 45 and 70 mph (72 and 112 km/h) or by connecting a Jaguar approved diagnostic system to the vehicle which will guide the technician through an automated regeneration procedure to clean the DPF.

Diesel Particulate Filter Control

The DPF requires constant monitoring to ensure that it is operating at its optimum efficiency and does not become blocked. The ECM contains DPF software which controls the monitoring and operation of the DPF system and also monitors other vehicle data to determine regeneration periods and service intervals.

The DPF software can be divided into three separate control software modules; a DPF supervisor module, a DPF fuel management module and a DPF air management module.

These three modules are controlled by a fourth software module known as the DPF co-ordinator module. The co-ordinator module manages the operation of the other modules when an active regeneration is requested. The DPF supervisor module is a sub-system of the DPF co-ordinator module.

DPF Fuel Management Module

The DPF fuel management module controls the following functions:

- • Timing and quantity of the four split injections per stroke (pilot, main and two post injections)
- • Injection pressure and the transition between the three different calibration levels of injection.

The above functions are dependant on the condition of the catalytic converter and the DPF.

The controlled injection determines the required injection level in addition to measuring the activity of the catalytic converter and the DPF. The fuel management calculates the quantity and timing for the four split injections, for each of the three calibration levels for injection pressure, and also manages the transition between the levels.

The two post injections are required to separate the functionality of increasing in-cylinder gas temperatures and the production of hydrocarbons. The first post injection is used to generate the higher in-cylinder gas temperature while simultaneously retaining the same engine torque output produced during normal (non-regeneration) engine operation. The second post injection is used to generate hydrocarbons by allowing unburnt fuel into the catalytic converter without producing increased engine torque.

DPF Air Management Module

The DPF air management module controls the following functions:

- • EGR control
- • Turbocharger boost pressure control
- • Intake air temperature and pressure control.

During active regeneration, the EGR operation is disabled and the closed-loop activation of the turbocharger boost controller is calculated. The air management module controls the air in the intake manifold to a predetermined level of pressure and temperature. This control is required to achieve the correct in-cylinder conditions for stable and robust combustion of the post injected fuel.

The module controls the intake air temperature by actuating the EGR throttle and by adjustment of the turbocharger boost pressure control.

DPF Co-ordinator Module

The DPF co-ordinator module reacts to a regeneration request from the supervisor module by initiating and co-ordinating the following DPF regeneration requests:

- EGR cut-off
- Turbocharger boost pressure control
- Engine load increase
- Control of air pressure and temperature in the intake manifold
- Fuel injection control.

When the supervisor module issues a regeneration request, the co-ordinator module requests EGR cut-off and a regeneration specific turbocharger boost pressure control. It then waits for a feedback signal from the EGR system confirming that the EGR valve is closed.

When the EGR valve is closed, the co-ordinator module initiates requests to increase engine load by controlling the intake air temperature and pressure.

Once confirmation is received that intake conditions are controlled or a calibration time has expired, the co-ordinator module then changes to a state awaiting an accelerator pedal release manoeuvre from the driver. If this occurs or a calibration time has expired, the co-ordinator module generates a request to control fuel injections to increase exhaust gas temperature.

Exhaust System - TDV6 3.0L Diesel - Exhaust System

Diagnosis and Testing

Principle of Operation

For a detailed description of the exhaust system, refer to the relevant Description and Operation section of the workshop manual.

REFER to: Exhaust System (309-00A, Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle

• **NOTE:** Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests

1. **1.** Verify the customer concern
2. **2.** Visually inspect for obvious signs of mechanical or electrical damage

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> ● Leaks ● Metal fatigue ● Pipes ● Catalytic converter ● Muffler(s) ● Joints ● Mountings ● Clearance around components 	<ul style="list-style-type: none"> ● Fuses ● Wiring harness ● Electrical connector(s) ● Sensor(s) ● Engine Control Module (ECM)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. **4.** If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for DTCs and refer to the DTC Index

Symptom Chart

Symptom	Possible Causes	Action
Noisy or leaking exhaust	<ul style="list-style-type: none"> ● Exhaust system/components 	Install new components as necessary. Refer to the relevant section of the workshop manual
Lack of power	<ul style="list-style-type: none"> ● Air intake system fault ● Restricted exhaust system ● Low fuel pressure ● Exhaust Gas Recirculation (EGR) valve(s) fault ● Turbocharger fault 	Check the air intake system. Check for a blocked catalytic converter or muffler, install new components as necessary. Check the fuel pressure. For EGR and turbocharger tests, refer to the relevant section of the workshop manual

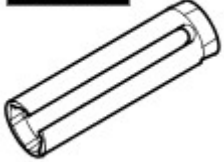
DTC Index

For a complete list of all diagnostic trouble codes that could be logged on this vehicle, please refer to Section 100-00. REFER to: [Diagnostic Trouble Code \(DTC\) Index - TDV6 3.0L Diesel, DTC: Engine Control Module \(PCM\)](#) (100-00 General Information, Description and Operation).

Exhaust System - TDV6 3.0L Diesel - Catalytic Converter


Removal and Installation

Special Tool(s)

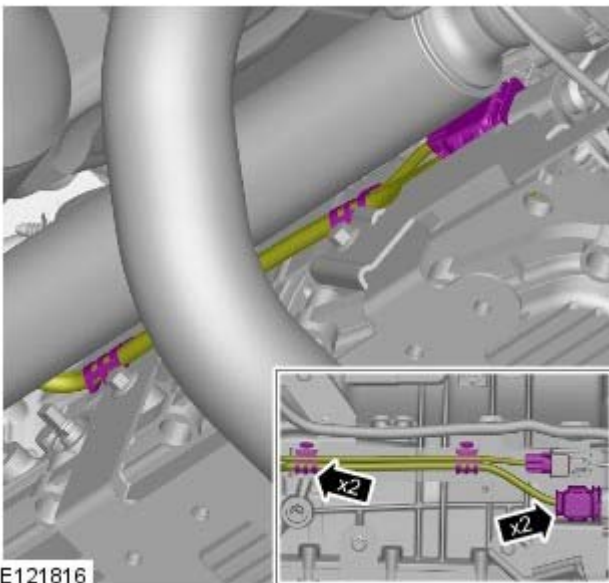
 <p>310-121 E53465</p>	<p>310-121 Wrench, H02S</p>
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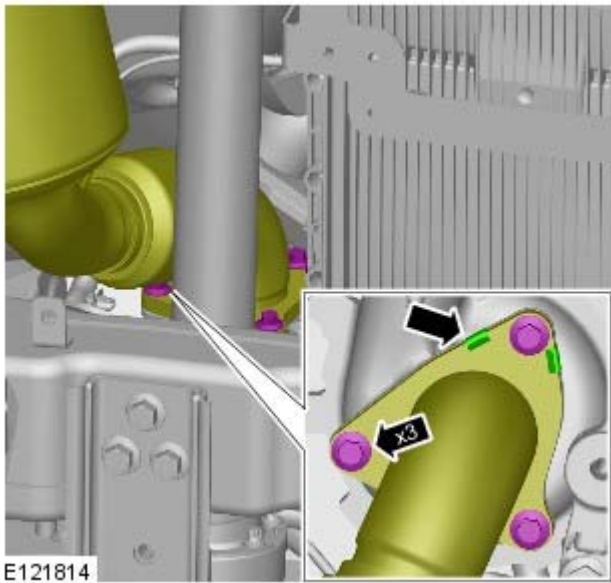
Removal


- NOTE: Removal steps in this procedure may contain installation details.

1.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.
Raise and support the vehicle.
2. Refer to: [Engine Undershield](#) (501-02 Front End Body Panels, Removal and Installation).
3. Refer to: [Transmission Support Crossmember - TDV6 3.0L Diesel](#) (502-02 Full Frame and Body Mounting, Removal and Installation).

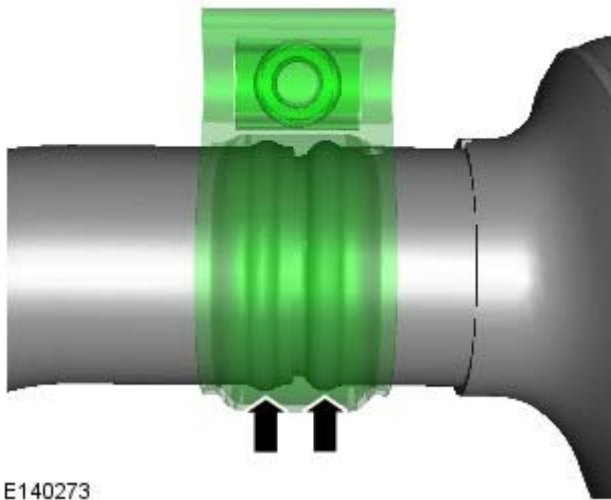
4.



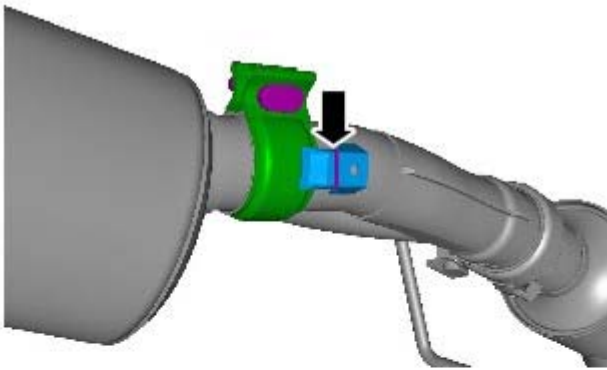


5.  CAUTION: Make sure that the exhaust system is supported with suitable retaining straps.

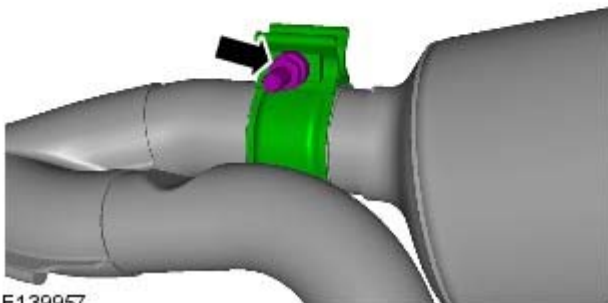
Torque: 28 Nm



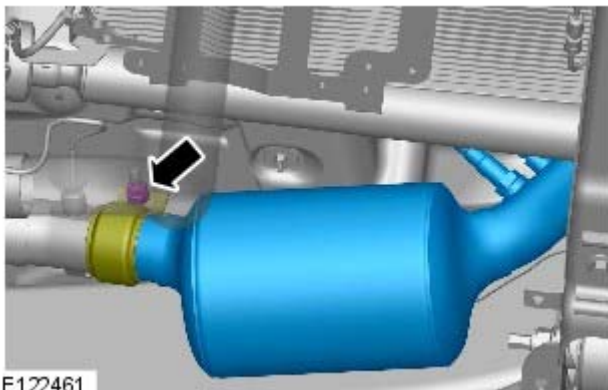
6. **6.** NOTE: Note the orientation of the component prior to removal.



E139957



E122461



E122462

7.  **WARNING:** Always wear hand, eye and ear safety standard protection when grinding.


 **CAUTION:** Discard the clamp.

- **NOTE:** For vehicles with a welded exhaust clamp only.

Using suitable cutting/grinding equipment remove the clamp weld at the point illustrated.

Torque: 55 Nm

8. **8. CAUTIONS:**

 If weld is present on the clamp, grind off and install a new clamp.

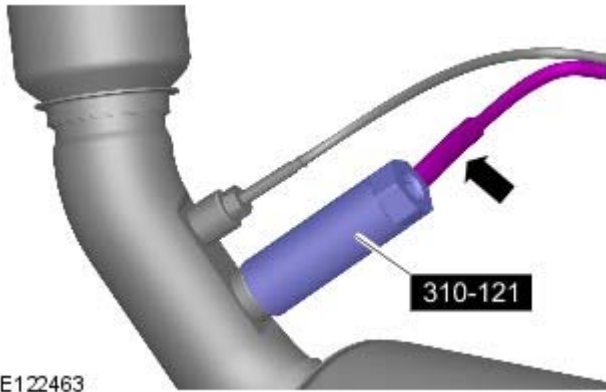
 Discard the clamp.

- **NOTE:** Note the orientation of the component prior to removal.

Torque: 55 Nm

9. **9. NOTE:** Do not disassemble further if the component is removed for access only.

Torque: 35 Nm



10. **10.** NOTE: Do not disassemble further if the component is removed for access only.

Special Tool(s): [310-121](#)
Torque: [48 Nm](#)

Installation

1. **1.** CAUTIONS:



If accidentally dropped or knocked install a new sensor.



Make sure the HO2S wiring harness is not twisted more than 180 degrees and is not in contact with either the exhaust or driveshaft.

- NOTE: Install the retaining clamp.
- NOTE: Make sure the anti-seize compound does not contact the heated oxygen sensor (HO2S) tip.
- NOTE: If the original sensor is to be installed, apply lubricant meeting specification ESE-M12A4-A to the thread of the sensor.

To install, reverse the removal procedure.

Exhaust System - TDV6 3.0L Diesel - Diesel Particulate Filter (DPF)

Removal and Installation

General Equipment

Transmission jack

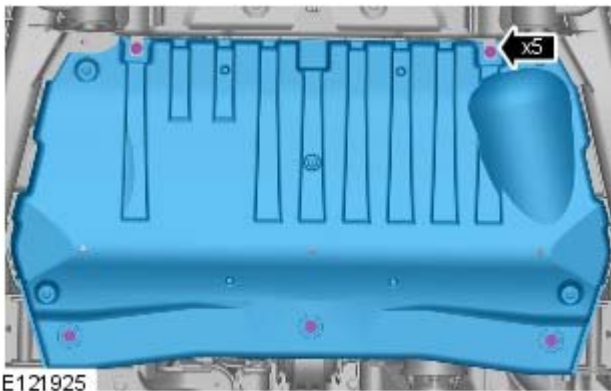
Removal

- NOTE: Removal steps in this procedure may contain installation details.

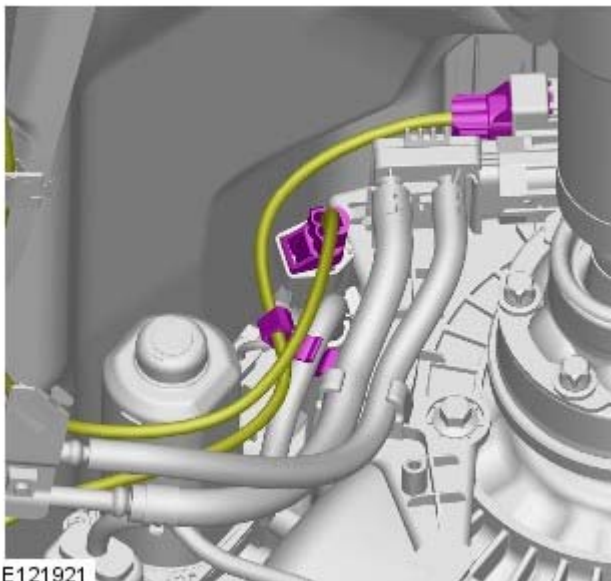
1.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Torque: 10 Nm

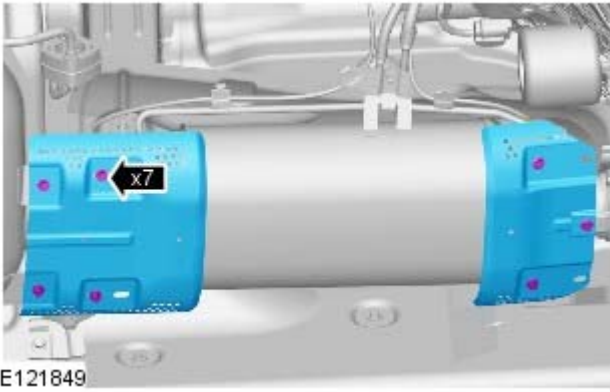


E121925

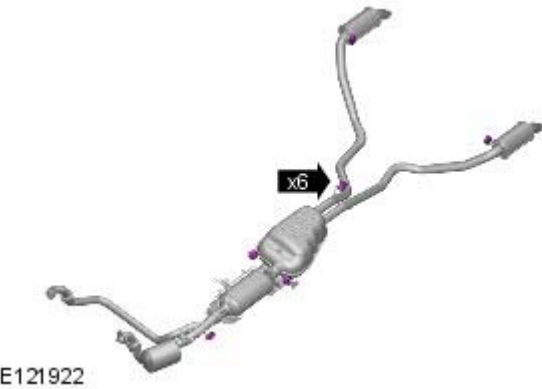



E121921

- 3.



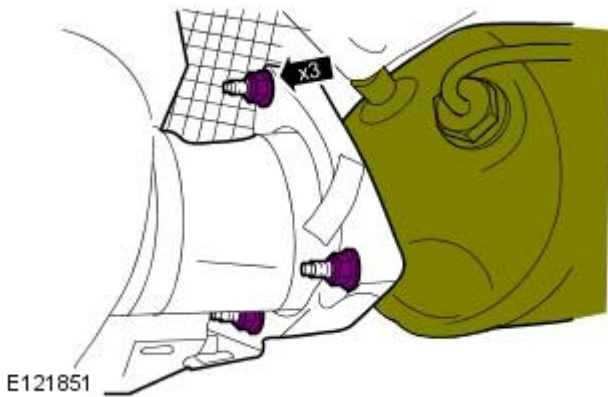
4. Torque: 10 Nm



5.  CAUTION: Make sure that the exhaust system is supported with a suitable transmission stand.

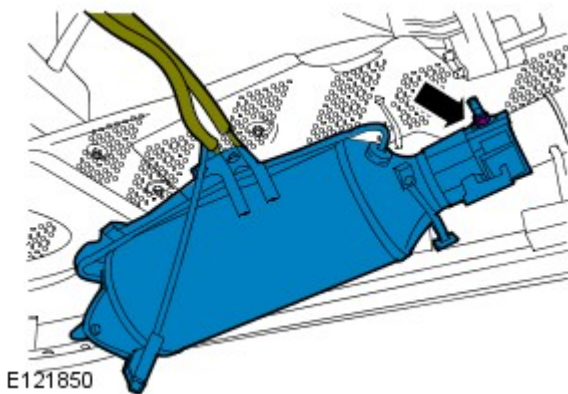
Release the 6 exhaust hangers.

General Equipment: [Transmission jack](#)



6. NOTE: Discard the gasket.

Torque: 23 Nm



7. Torque: 50 Nm

Installation

1. To install, reverse the removal procedure.

2. If a new unit is installed, configure using the approved diagnostic tool.

Exhaust System - TDV6 3.0L Diesel - Exhaust System

Removal and Installation

Removal

- NOTE: Removal steps in this procedure may contain installation details.

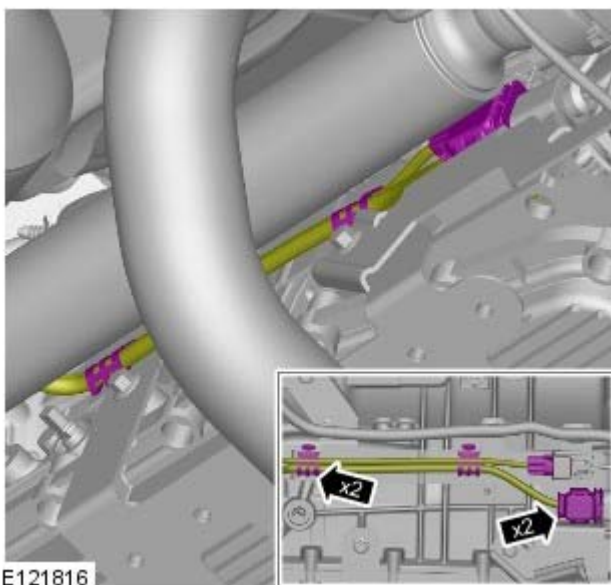
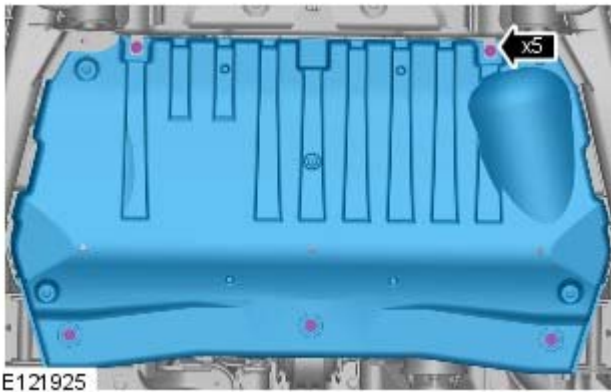
All vehicles

1.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

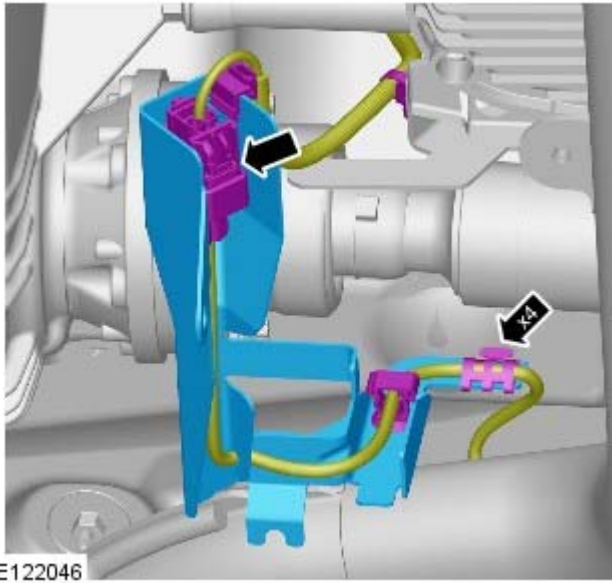
Raise and support the vehicle.

2. Refer to: [Engine Undershield](#) (501-02 Front End Body Panels, Removal and Installation).
3. Refer to: [Transmission Support Crossmember - TDV6 3.0L Diesel](#) (502-02 Full Frame and Body Mounting, Removal and Installation).

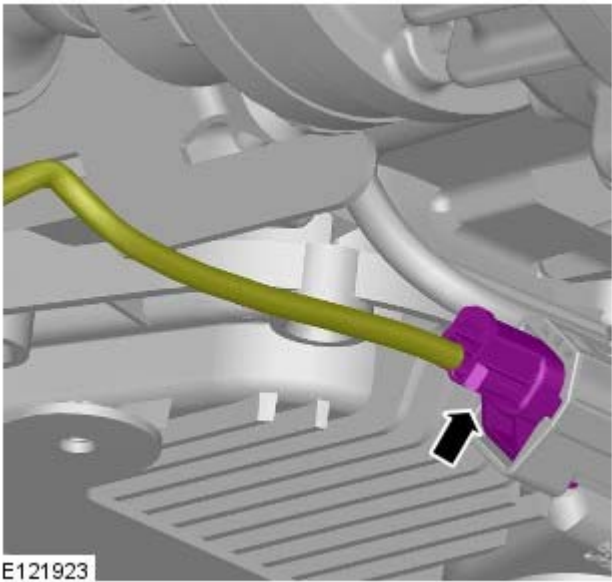
4. Torque: 10 Nm



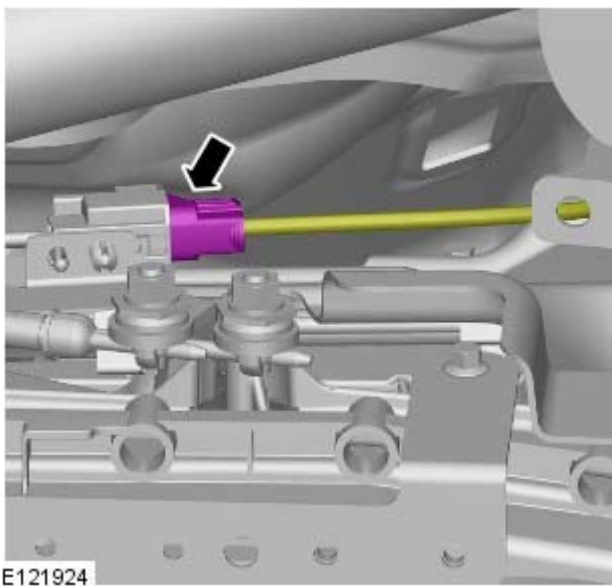
- 5.



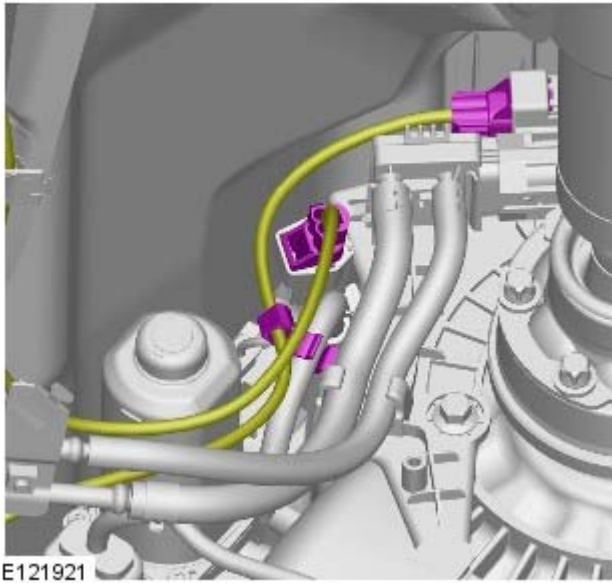
6.



7.

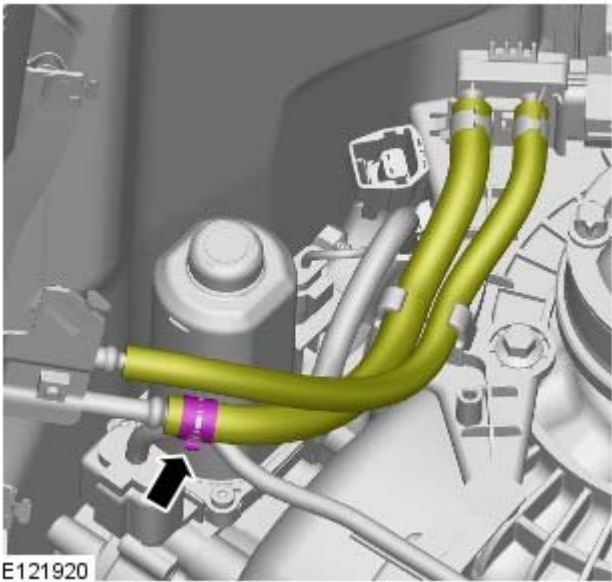


8.



E121921

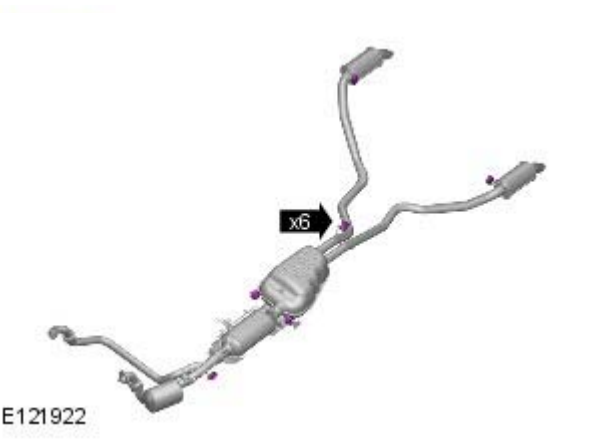
9.



E121920

10.

All vehicles



E121922

- 13. **NOTE:** Do not disassemble further if the component is for a 6A or 6B. Make sure that the exhaust system is supported with suitable retaining straps.
- 12. **CAUTION:** With assistance, remove the exhaust system.
Torque: 28 Nm

Installation



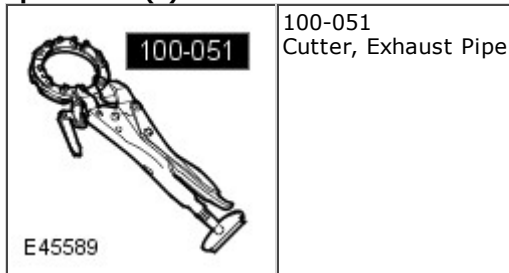
E121815

1. To install, reverse the removal procedure.

Exhaust System - TDV6 3.0L Diesel - Front Muffler

Removal and Installation

Special Tool(s)



General Equipment

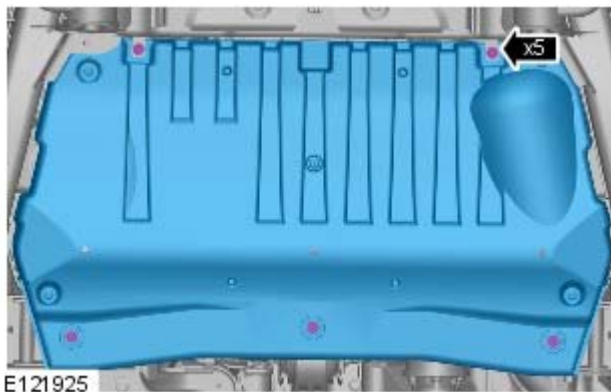
Transmission jack

Removal

All vehicles

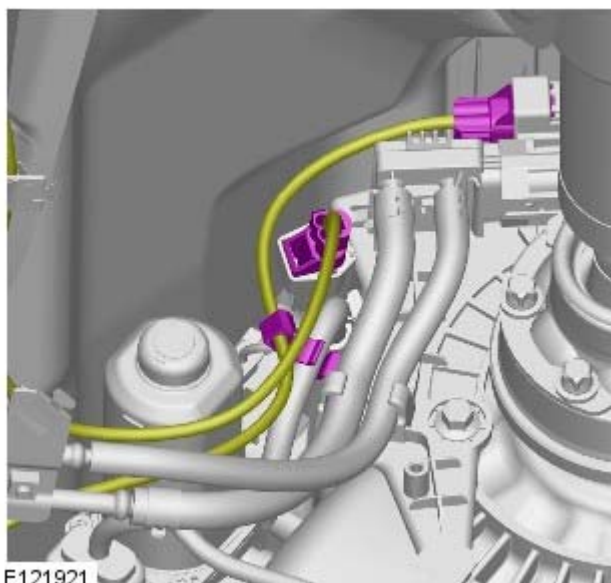
1.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

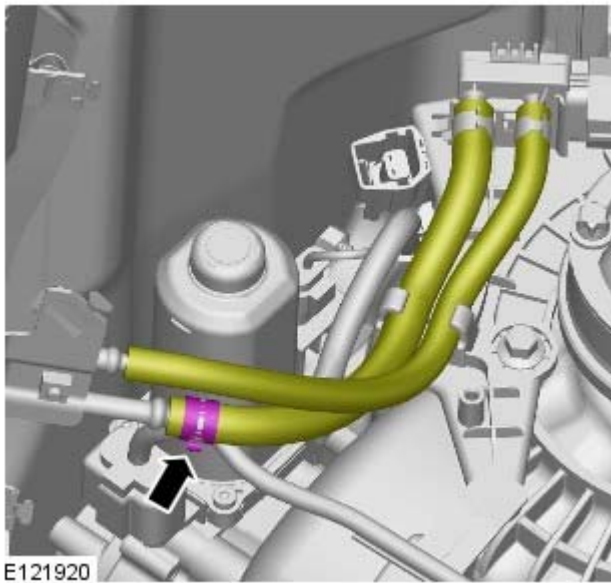


2. Remove the 6 bolts.

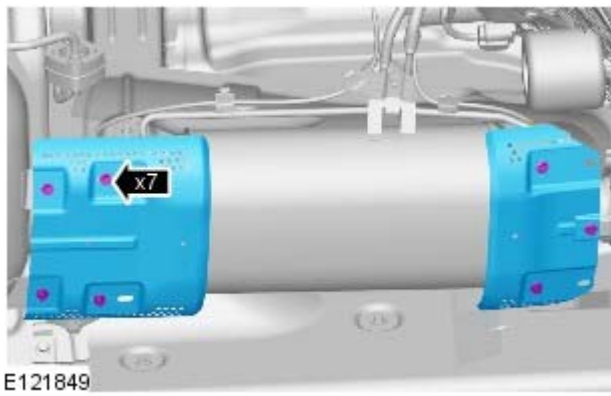
Vehicles with diesel particulate filter (DPF)



- 3.

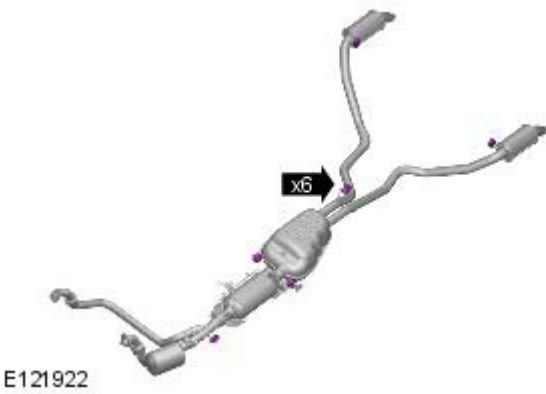



4.



5.

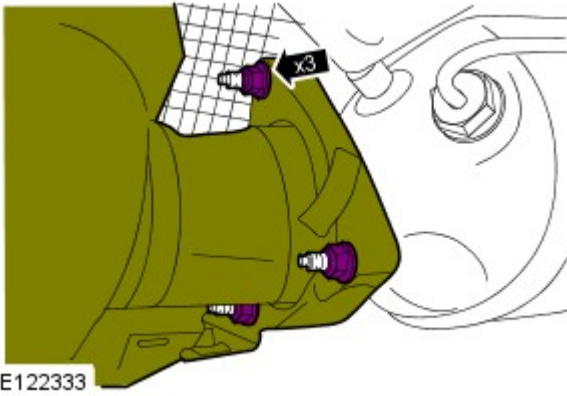
All vehicles



6.  **CAUTION:** Make sure that the exhaust system is supported with a suitable transmission stand.

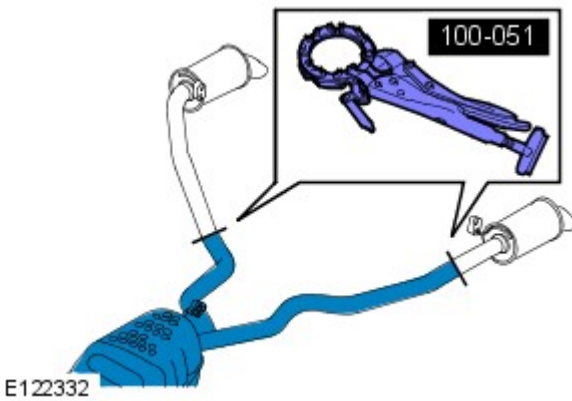
Release the 6 exhaust hangers.

General Equipment: [Transmission jack](#)



7. **7. NOTE: Discard the gasket.**

With assistance, remove the muffler and tailpipe assembly.



8. Using the special tool, cut the exhaust pipe at the marked position.

Special Tool(s): [100-051](#)

Installation

All vehicles

1. **1. NOTE: Do not tighten the retaining clamp at this stage.**
Position the RH tail pipe to the muffler assembly.
2. **2. NOTE: Do not tighten the retaining clamp at this stage.**
Position the LH tail pipe to the muffler assembly.
3. **3. NOTE: Install a new gasket.**
With assistance, install the muffler assembly.
4. Tighten the nuts to 23 Nm (17 lb.ft).
5. Align both tail pipes and tighten the retaining clamps to 55 Nm (40 lb.ft).

Vehicles with diesel particulate filter (DPF)

6. Install the heat shields.

Torque: 10 Nm
7. Install the DPF differential pressure sensor, high and low pressure pipes.
8. Connect the DPF differential pressure sensor electrical connectors.

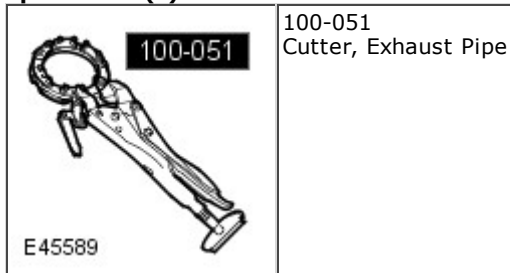
All vehicles

9. Install the transmission undershield.
10. Install the bolts and tighten to 10 Nm (7 lb.ft).

Exhaust System - TDV6 3.0L Diesel - Rear Muffler

Removal and Installation

Special Tool(s)

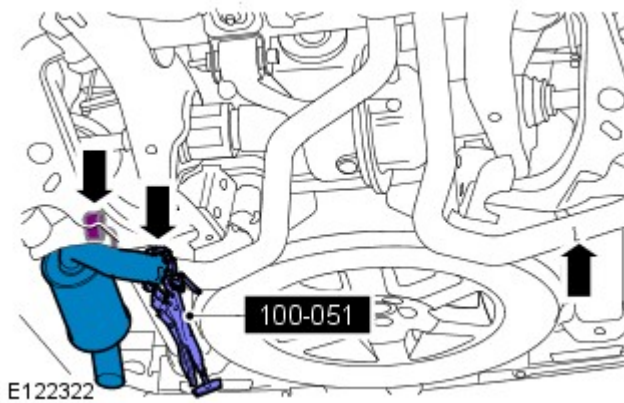


Removal

- NOTE: Removal steps in this procedure may contain installation details.

1.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.



2. **2.** NOTE: Right-hand shown, left-hand similar.

- NOTE: Using the special tool, cut the exhaust pipe at the marked position.

Remove the tail pipe.

Special Tool(s): [100-051](#)

Installation

1. **1.** NOTE: Do not tighten the retaining clamp at this stage.

- NOTE: Clean the components.
- NOTE: Install the retaining clamp.

Install the tail pipe.

2. Align the tail pipe and tighten the retaining clamp to 55 Nm (40 lb.ft).

Exhaust System - V6 4.0L Petrol -

Recommended Lubricant

Item	Specification
HO2S threads	Use a high temperature resistant anti-seize compound

General Specifications

Item	Specification
Exhaust manifolds	Fabricated, air gapped with exhaust gas recirculation (EGR) tapping on left hand manifold
Exhaust system	Twin, stainless steel pipes throughout with stainless steel mufflers
Catalytic converters - type/location	Close coupled cascade - located in each down pipe with pre and post catalyst sensors in both pipes

Torque Specifications

Description	Nm	lb-ft
** HO2S	45	33
Catalytic converter retaining clamp	55	40
Catalytic converter to muffler nuts and retaining clamp	48	35
Tailpipe clamps	55	40
* Catalytic converter to exhaust manifold bolts	22	16

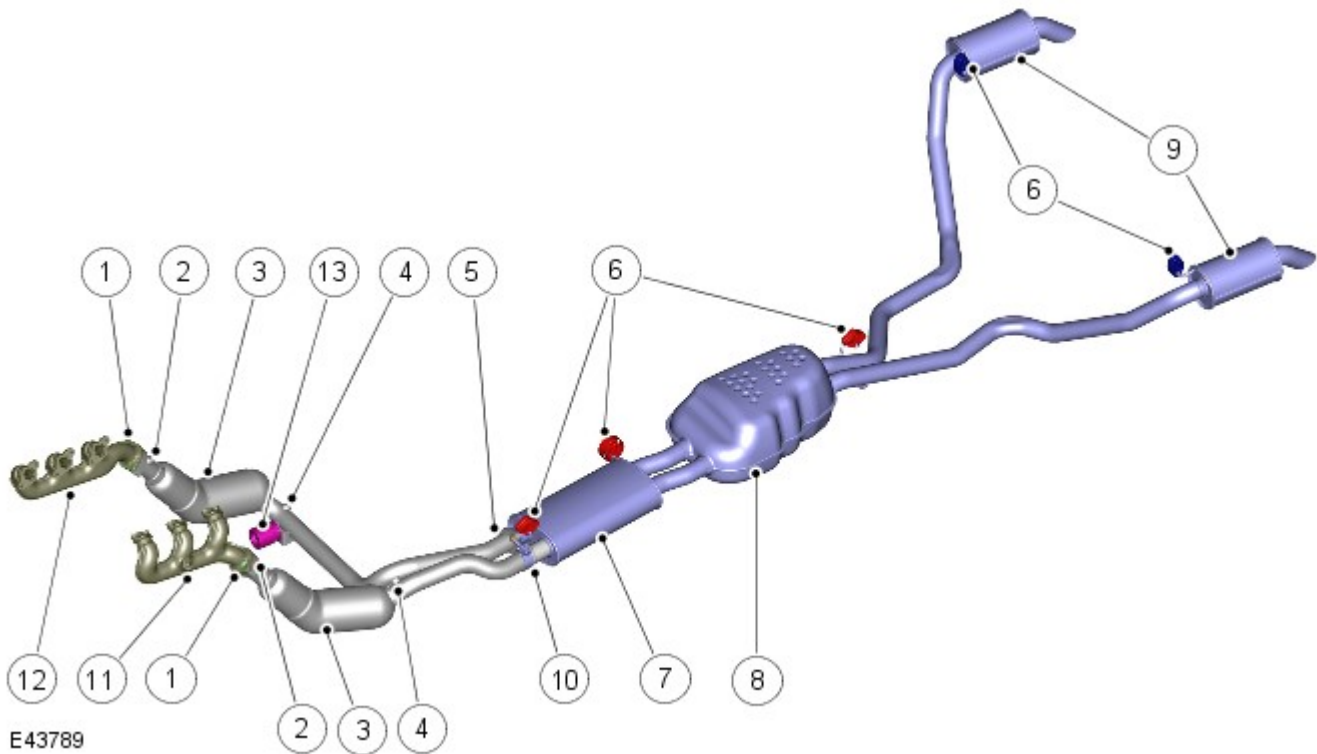
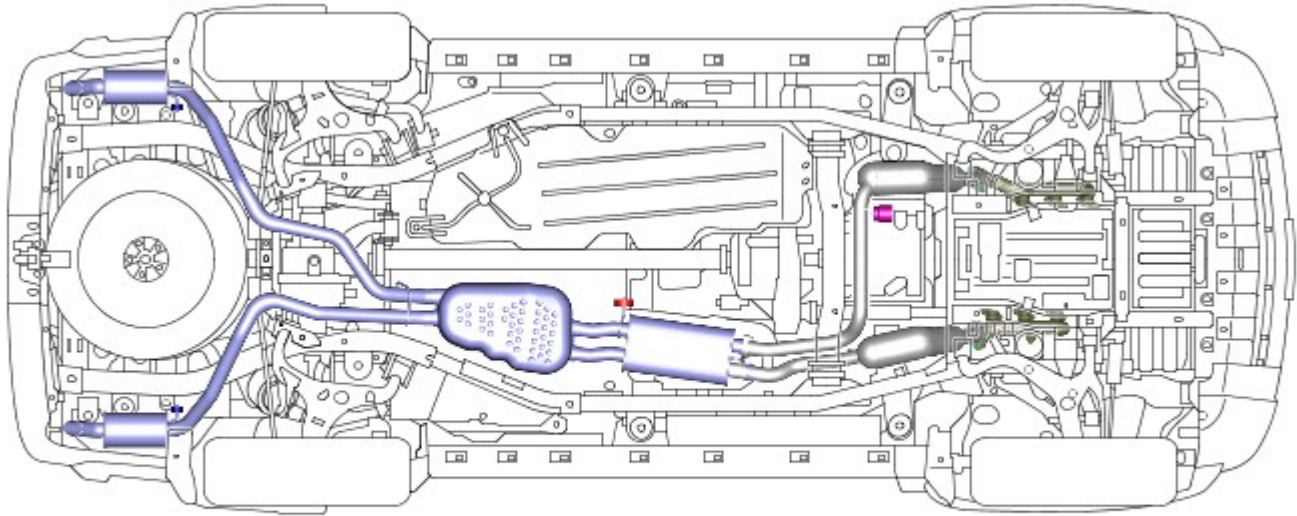
*** New bolts must be installed**

**** Apply suitable high temperature resistant anti-seize compound**

Exhaust System - V6 4.0L Petrol - Exhaust System

Description and Operation

4.0L V6 Exhaust System Component Location



E43789

Item	Part Number	Description
1	-	Flange - manifold to front section
2	-	Pre catalyst heated oxygen sensor location
3	-	Catalyst
4	-	Post catalyst heated oxygen sensor location
5	-	Flange - RH front section to rear section
6	-	Mounting rubber (5 off)
7	-	Silencer - Front
8	-	Silencer - Centre
9	-	Silencer - Rear
10	-	Clamp - LH front section to rear section
11	-	LH manifold
12	-	RH manifold
13	-	Mass damper

GENERAL

The 4.0L V6 exhaust system is fabricated from stainless steel and is supplied as three separate assemblies; a LH front section incorporating a catalytic converter, a RH front section incorporating a catalytic converter and a rear section

incorporating a front silencer (non-NAS only), a centre silencer and two rear silencers.

The system is attached to the underside of the body with five mounting rubbers which are located on mild steel hanger bars that are welded to the system. The mounting rubbers locate on corresponding hangers which are welded to the underside of the vehicle body. The system is routed mainly on the inside of the LH chassis longitudinal before splitting near the rear differential to exit at each side of the rear of the vehicle.

The system has service repair items available. Indentations in the rear section, between the center and the rear silencers, show the cut points for the service replacement rear silencers or front section. When a service repair section is used, the joint is connected using a sleeve and two clamps to connect the pipes at the cut points.

FRONT SECTION

Both front sections have a welded flange with two holes which provide for the attachment with two bolts to the LH and RH exhaust manifolds. The flange is sealed by a tapered seat in the flange and a machined cone on the manifold.

The flange is welded to a short, straight pipe, which in turn is welded to the body of the catalytic converter. The pipe has a threaded boss which is welded over a hole in the pipe to provide location for the pre catalyst heated oxygen sensor (HO2S).

On the LH front section, the converter outlet pipe is a 55 mm (2.16 in) diameter tube, with a 1.5 mm (0.06 in) wall thickness, which is welded to the converter body. The rear of the outlet pipe is inserted into the flared end of the rear section. A clamp is used to compress and secure the joint.

On the RH front section, the converter outlet pipe is a 55 mm (2.16 in) diameter tube, with a 1.5 mm (0.06 in) wall thickness, which is welded to the converter body. The rear of the pipe curves left, under the transmission and then curves again to run parallel to the LH pipe. The end of the pipe has a welded flange with two holes which locate on two studs on the rear section and is secured with nuts. A metal gasket is used to seal the joint between the front and rear section flanges.

Both the LH and RH converter outlet pipes have a threaded boss which is welded over a hole in the pipe to provide location for the post catalyst HO2S.

REAR SECTION

The rear section has a short 55 mm (2.16 in) diameter tube, with a 1.5 mm (0.06 in) wall thickness, which is flared to an inside diameter of 55 mm (2.16 in) to locate the LH front section. The tube is welded to the front silencer assembly. A second short 55 mm (2.16 in) diameter tube, with a 1.5 mm (0.06 in) wall thickness, has a welded flange with captive studs to provide attachment for the flange on the RH front section. This tube is also welded to the front silencer assembly.

The front silencer comprises a single skin and two end plates which are welded together which give a capacity of 6.4 litres (390.5 in³). The silencer contains baffles and perforated tubes which reduce noise as the exhaust gases pass through the silencer. A hanger bar is welded to the front of the silencer and provides for the location of a mounting rubber.

The silencer has two short 55 mm (2.16 in) diameter outlet pipes, with a 1.5 mm (0.06 in) wall thickness, which connect to the centre silencer.

The centre silencer comprises two pressed stainless steel shells which are welded together to give a capacity of 25.2 litres (1538 in³). The silencer contains baffles and perforated tubes which reduce noise as the exhaust gasses pass through the silencer. A hanger bar is welded to the front right hand side of the silencer and provides location for a mounting rubber.

The silencer has two 55 mm (2.16 in) diameter outlet pipes, with a 1.5 mm (0.06 in) wall thickness, which are curved to pass around the rear suspension components.

Each outlet pipe terminates in a welded joint with the tail silencers. The outlet pipes have a hanger bar which provides for the location of a mounting rubber.

A hanger bar is welded to the front face of each rear silencer and provides for the location of a mounting rubber. The silencer is a circular fabrication with a baffle tube which is surrounded with glass fibre to provide further noise suppression. Each silencer has a capacity of 2.7 litres (165 in³).

The silencers each have an outlet pipe which is 55 mm (2.2 in) diameter, with a wall thickness of 1.2 mm (0.05 in). Each outlet pipe is curved downwards to direct exhaust gasses away from the rear of the vehicle.

CATALYTIC CONVERTER

The engine management system provides accurately metered quantities of fuel to the combustion chambers to ensure the most efficient use of fuel and to minimise the exhaust emissions.

To further reduce the carbon monoxide and hydrocarbons content of the exhaust gases, a catalytic converter is integrated into the front pipe of the exhaust system. In the catalytic converter the exhaust gases are passed through honeycombed ceramic elements coated with a special surface treatment called 'washcoat'. The washcoat increases the surface area of the ceramic elements by a factor of approximately 7000. On top of the washcoat is a coating containing metals, which are the active constituent for converting harmful emissions into inert by-products. The metals add oxygen to the carbon monoxide and the hydrocarbons in the exhaust gases, to convert them into carbon dioxide and water respectively.

Exhaust System - V6 4.0L Petrol - Exhaust System

Diagnosis and Testing

Principle of Operation

For a detailed description of the exhaust system, refer to the relevant Description and Operation section of the workshop manual. REFER to: [Exhaust System](#) (309-00C Exhaust System - V6 4.0L Petrol, Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

- **NOTE:** Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> ● Leaks ● Metal fatigue ● Pipes ● Catalytic converter ● Muffler(s) ● Joints ● Mountings ● Clearance around components 	<ul style="list-style-type: none"> ● Fuses ● Wiring harness ● Electrical connector(s) ● Sensor(s) ● Engine Control Module (ECM)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

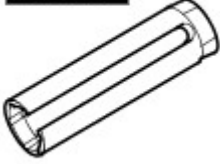
Symptom	Possible Causes	Action
Noisy or leaking exhaust	<ul style="list-style-type: none"> ● Exhaust system/components 	Install new components as necessary. Refer to the relevant section of the workshop manual.
Lack of power	<ul style="list-style-type: none"> ● Air intake system fault ● Restricted exhaust system ● Low fuel pressure 	Check the air intake system. Check for a blocked catalytic converter or muffler, install new components as necessary. Check the fuel pressure. Refer to the relevant section of the workshop manual.

DTC Index


For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.

Exhaust System - V6 4.0L Petrol - Catalytic Converter LH

Removal and Installation

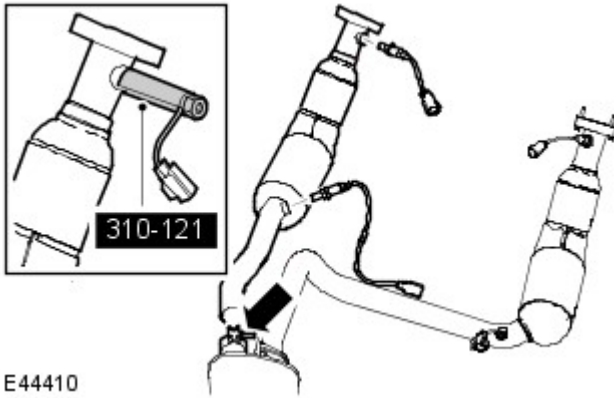
Special Tool(s)	
 <p>310-121</p> <p>E53465</p>	<p>Wrench, HO2S</p> <p>310-121 (LRT-19-014)</p>

Removal


1. Disconnect the battery ground cable.
For additional information, refer to: [Specifications](#) (414-00 Battery and Charging System - General Information, Specifications).
2.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.
3. Remove the exhaust system.
For additional information, refer to: [Exhaust System](#) (309-00C Exhaust System - V6 4.0L Petrol, Removal and Installation).
4. Remove the catalytic converter.
 - Remove the nut and release the retaining clamp.
5. **NOTE:** Do not disassemble further if the component is removed for access only.

Using the special tool, remove both HO2S from the catalytic converter.



Installation

1.  **CAUTION:** Make sure the anti-seize compound does not contact the HO2S tip.

Using the special tool, install the HO2S to the catalytic converter and tighten to 45 Nm (33 lb.ft).
 - Clean the components.
 - Apply an anti-seize compound to the thread of the HO2S.
2. **NOTE:** Do not tighten the retaining clamp at this stage.

Position the catalytic converter to the front muffler.
 - Clean the components.
 - Install the nut.
3. Install the exhaust system.
For additional information, refer to: [Exhaust System](#) (309-00C Exhaust System - V6 4.0L Petrol, Removal and Installation).
4. Tighten the catalytic converter retaining clamp to 55 Nm (40

lb.ft).

5. Connect the battery ground cable.

For additional information, refer to: [Specifications](#) (414-00 Battery and Charging System - General Information, Specifications).

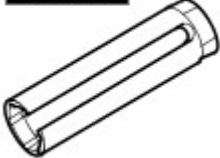
6. NOTE: For NAS vehicles only.

If required, carry out a long drive cycle.


For additional information, refer to: Powertrain Control Module (PCM) Long Drive Cycle Self-Test (303-14A, General Procedures).

Exhaust System - V6 4.0L Petrol - Catalytic Converter RH

Removal and Installation

Special Tool(s)	
 <p>310-121</p> <p>E53465</p>	<p>Wrench, HO2S</p> <p>310-121 (LRT-19-014)</p>

Removal

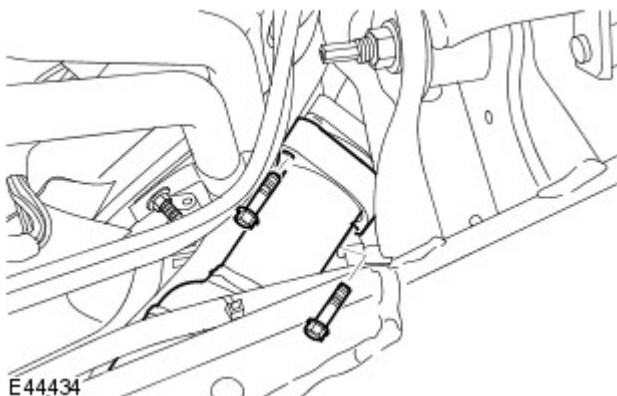
1. Disconnect the battery ground cable.
For additional information, refer to: [Specifications](#) (414-00 Battery and Charging System - General Information, Specifications).
2.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

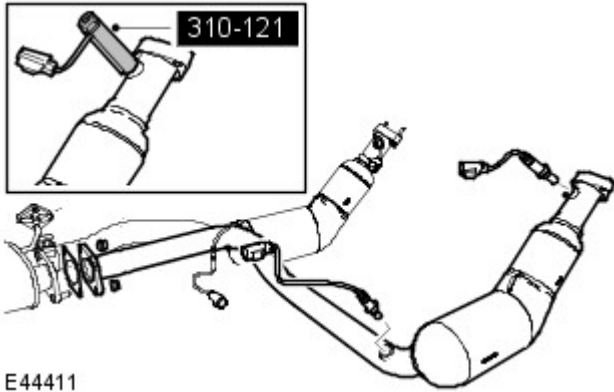
3. Remove the transmission crossmember.
For additional information, refer to: [Transmission Support Crossmember - V8 5.0L Petrol](#) (502-02 Full Frame and Body Mounting, Removal and Installation).
4. Release the RH rear HO2S wiring harness.
 - Disconnect the electrical connector.



5. Disconnect the catalytic converter from the exhaust manifold.
 - Remove and discard the 2 bolts.



6. Remove the catalytic converter.
 - Remove the 2 nuts.
 - Discard the gasket.



E44411

7. NOTE: Do not disassemble further if the component is removed for access only.

Using the special tool, remove both HO2S from the catalytic converter.

Installation

1.  **CAUTION:** Make sure the anti-seize compound does not contact the HO2S tip.

Using the special tool, install the HO2S to the catalytic converter and tighten to 45 Nm (33 lb.ft).

- Clean the components.
- Apply an anti-seize compound to the thread of the HO2S.

2. Position the catalytic converter to the front muffler.


- Clean the components.
- Install a new gasket.
- Tighten the nuts to 55 Nm (40 lb.ft).

3. Position the catalytic converter to the exhaust manifold.

- Clean the components.
- Tighten the new bolts to 22 Nm (16 lb.ft).

4. Install the transmission crossmember.

For additional information, refer to: [Transmission Support Crossmember - V8 5.0L Petrol](#) (502-02 Full Frame and Body Mounting, Removal and Installation).

5.  **CAUTION:** Make sure the HO2S wiring harness is not twisted more than 180 degrees and is not in contact with either the exhaust or driveshaft.

Connect the HO2S electrical connector.

- Attach the HO2S wiring harness.

6. Connect the battery ground cable.

For additional information, refer to: [Specifications](#) (414-00 Battery and Charging System - General Information, Specifications).

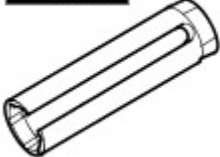
7. NOTE: For NAS vehicles only.

If required, carry out a long drive cycle.


For additional information, refer to: Powertrain Control Module (PCM) Long Drive Cycle Self-Test (303-14A, General Procedures).

Exhaust System - V6 4.0L Petrol - Exhaust System

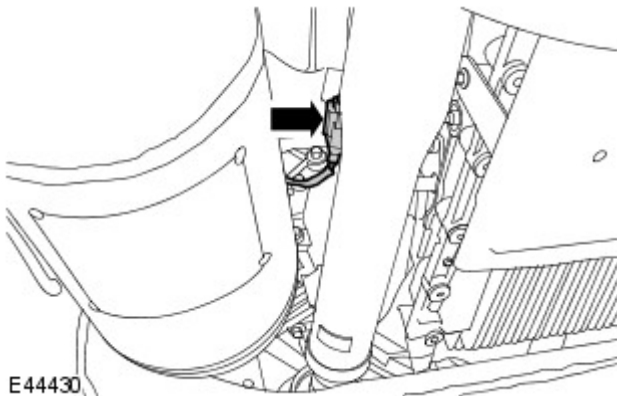
Removal and Installation

Special Tool(s)	
 <p>310-121</p> <p>E53465</p>	<p>Wrench, HO2S</p> <p>310-121 (LRT-19-014)</p>

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: [Specifications](#) (414-00 Battery and Charging System - General Information, Specifications).
2.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.
3. Remove the engine undershield.
For additional information, refer to: [Engine Undershield](#) (501-02 Front End Body Panels, Removal and Installation).
4. Remove the transmission crossmember.
For additional information, refer to: [Transmission Support Crossmember - V8 5.0L Petrol](#) (502-02 Full Frame and Body Mounting, Removal and Installation).
5. Release the LH front HO2S wiring harness.
 - Disconnect the electrical connector.



6. Release the RH front HO2S wiring harness.
 - Disconnect the electrical connector.

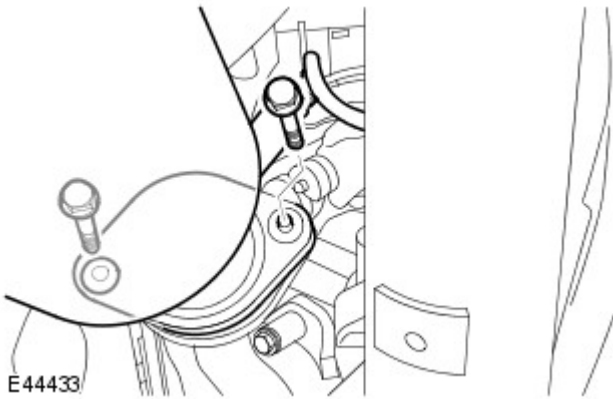


7. Release the LH rear HO2S wiring harness.
 - Disconnect the electrical connector.



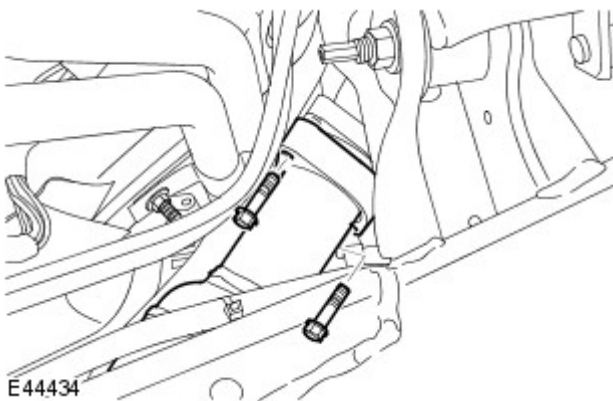
8. Release the RH rear HO2S wiring harness.

- Disconnect the electrical connector.



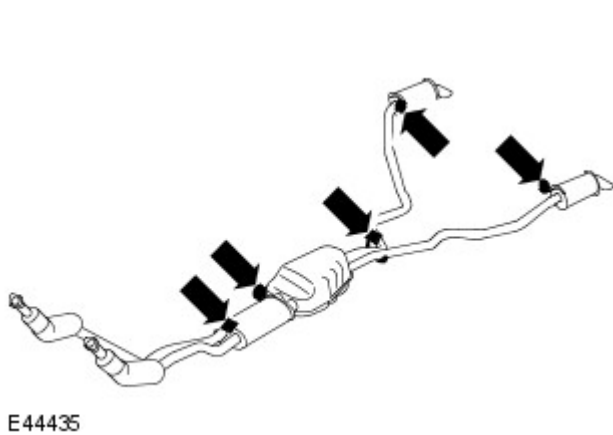
9. Disconnect the LH catalytic converter from the exhaust manifold.

- Remove and discard the 2 bolts.



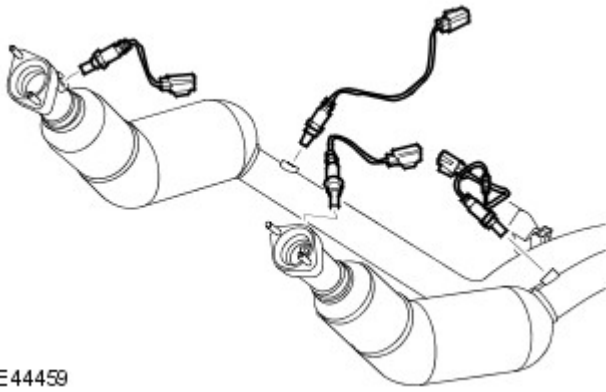
10. Disconnect the RH catalytic converter from the exhaust manifold.

- Remove and discard the 2 bolts.



11. With assistance, remove the exhaust system.

- Disconnect the 5 exhaust hangers.




E44459

12. NOTE: Do not disassemble further if the component is removed for access only.

Using the special tool, remove the 4 HO2S from the catalytic converters.

Installation

1.  **CAUTION:** Make sure the anti-seize compound does not contact the HO2S tip.

Using the special tool, install the HO2S to the catalytic converters and tighten to 45 Nm (33 lb.ft).

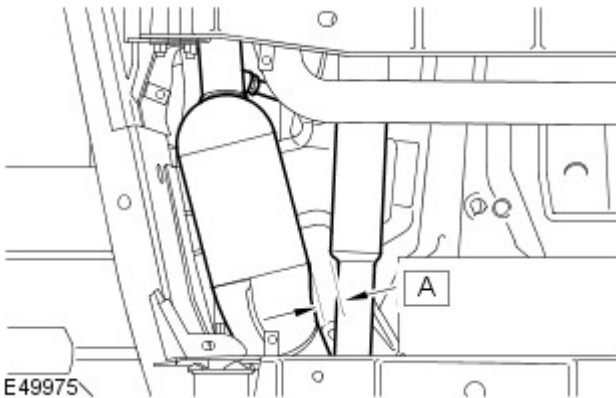
- Clean the components.
- Apply an anti-seize compound to the thread of the HO2S.

2. With assistance, install the exhaust system.


- Attach the exhaust hangers.

3. Position the RH catalytic converter to the exhaust manifold.

- Clean the components.
- Tighten the new bolts to 22 Nm (16 lb.ft).




E49975

4.  **CAUTION:** Make sure there is a clearance (A) of 25 mm to 30 mm between the closest points of the LH catalytic converter and the front driveshaft.

Position the LH catalytic converter to the exhaust manifold.

- Clean the components.
- Tighten the new bolts to 22 Nm (16 lb.ft).

5.  **CAUTION:** Make sure the HO2S wiring harness is not twisted more than 180 degrees and is not in contact with either the exhaust or driveshaft.

Connect the HO2S electrical connectors.

- Attach the HO2S wiring harnesses.

6. Install the transmission crossmember.

For additional information, refer to: [Transmission Support Crossmember - V8 5.0L Petrol](#) (502-02 Full Frame and Body Mounting, Removal and Installation).

7. Install the engine undershield.

For additional information, refer to: [Engine Undershield](#) (501-02 Front End Body Panels, Removal and Installation).


8. Connect the battery ground cable.

For additional information, refer to: [Specifications](#) (414-00 Battery and Charging System - General Information,


Specifications).

Exhaust System - V6 4.0L Petrol - Muffler

Removal and Installation

Special Tool(s)	
 E45589	Pipe cutter-exhaust
	100-051 (LRT-99-027)

Removal

-  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

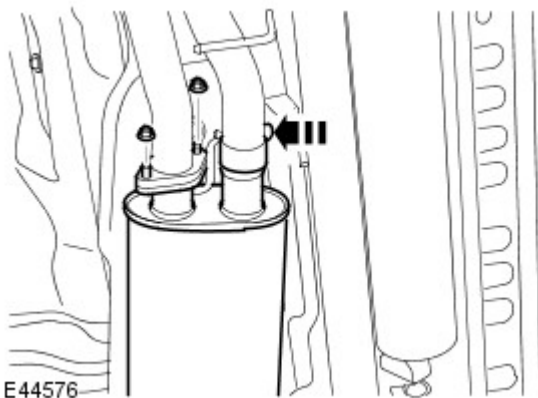
Raise and support the vehicle.

- Disconnect the RH catalytic converter from the muffler assembly.

- Remove the 2 nuts.
- Discard the gasket.

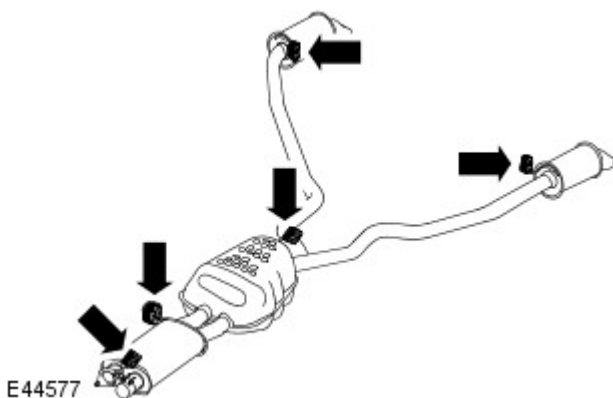
- Disconnect the LH catalytic converter from the muffler assembly.

- Remove the nut and release the retaining clamp.



- With assistance, remove the muffler assembly.

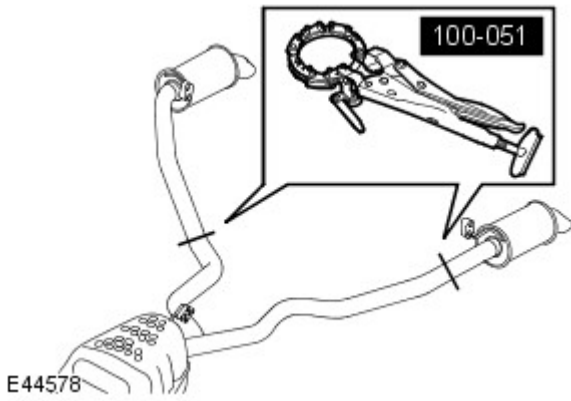
- Disconnect the 5 exhaust hangers.



- NOTE:** Do not disassemble further if the component is removed for access only.

Remove the LH tail pipe.

- Using 100-051, cut the tail pipe at the point indicated by a depression in the pipe.



6. Remove the RH tail pipe.

- Using 100-051, cut the tail pipe at the point indicated by a depression in the pipe.

Installation

1. NOTE: Do not tighten the retaining clamp at this stage.

Position the RH tail pipe to the muffler assembly.

- Clean the components.
- Install the retaining clamp.

2. NOTE: Do not tighten the retaining clamp at this stage.

Position the LH tail pipe to the muffler assembly.

- Clean the components.
- Install the retaining clamp.


3. With assistance, install the muffler assembly.

- Attach the exhaust hangers.
- Install a new gasket.
- Tighten the catalytic converter nuts and clamp to 48 Nm (35 lb.ft).


4. Align both tail pipes and tighten the retaining clamps to 55 Nm (40 lb.ft).

Exhaust System - V6 4.0L Petrol - Tailpipe

Removal and Installation

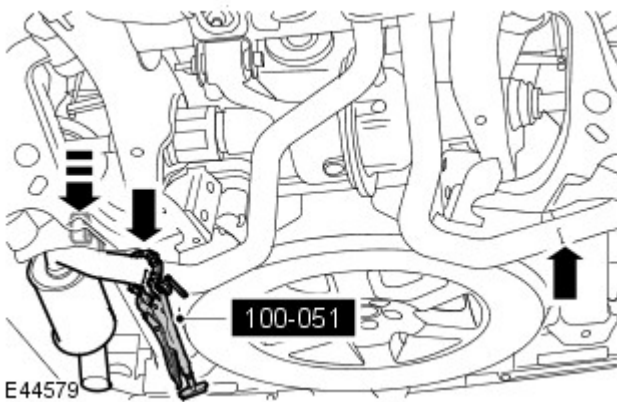
Special Tool(s)	
 <p>100-051</p> <p>E45589</p>	Pipe cutter-exhaust
	100-051 (LRT-99-027)

Removal

-  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

- Remove the tail pipe.
 - Using 100-051, cut the tail pipe at the point indicated by a depression in the pipe.
 - Disconnect from the exhaust hanger.



Installation

- NOTE:** Do not tighten the retaining clamp at this stage.

Install the tail pipe.

- Clean the components.
- Install the retaining clamp.

- Align the tail pipe and tighten the retaining clamp to 55 Nm (40 lb.ft).

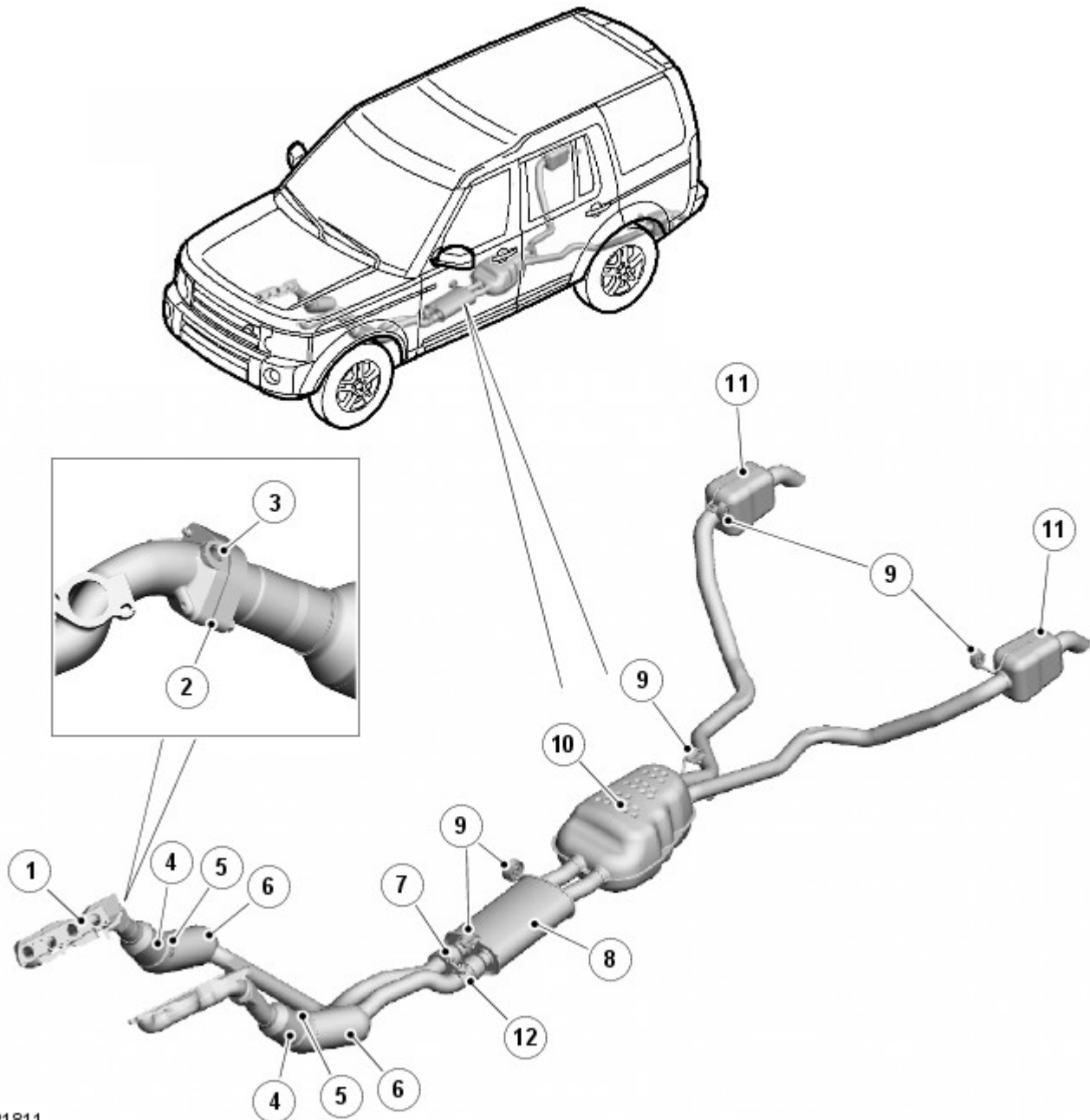
Exhaust System - V8 5.0L Petrol -**Torque Specifications**

Description	Nm	lb-ft	lb-in
Heated oxygen sensor (HO2S)	48	35	-
Catalyst monitor sensor	48	35	-
Catalytic converter retaining clamp	55	40	-
Catalytic converter retaining bolts to exhaust manifold	25	16	-
Exhaust manifold retaining bolts	18	13	-

Exhaust System - V8 5.0L Petrol - Exhaust System

Description and Operation

5.0L V8 COMPONENT LOCATION - FROM 2010MY



E121811

Item	Part Number	Description
1	-	Exhaust manifold
2	-	Flange joint - manifold to front section
3	-	Pre-catalyst Heated Oxygen Sensor (HO2S) mounting boss
4	-	Pre-catalytic converter
5	-	Post catalyst HO2S mounting boss
6	-	Main catalytic converter
7	-	Flange joint - Right Hand (RH) front section to rear section
8	-	Silencer - Front
9	-	Mounting rubber (5 off)
10	-	Silencer - Center
11	-	Silencer - Rear
12	-	Clamp joint - Left Hand (LH) front section to rear section

EXHAUST SYSTEM

The 5.0L V8 exhaust system is fabricated from stainless steel and is supplied as three separate assemblies; a Left Hand (LH) front section incorporating a catalytic converter, a Right Hand (RH) front section incorporating a catalytic converter

and a rear section incorporating a front silencer, a centre silencer and two rear silencers.

The system is attached to the underside of the body with 5 mounting rubbers which are located on mild steel hanger bars that are welded to the system. The mounting rubbers locate on corresponding hangers which are welded to the underside of the vehicle body. The system is routed mainly on the inside of the LH chassis longitudinal before splitting near the rear differential to exit at each side of the rear of the vehicle.

The system has service repair items available. Indentations in the rear section, between the center and the rear silencers, show the cut points for the service replacement rear silencers or front section. When a service repair section is used, the joint is connected using a sleeve and two clamps to connect the pipes at the cut points.

FRONT SECTION

Both front sections have a loose flange with two holes which provide for the attachment with two bolts onto the LH and RH exhaust manifolds. The flange is sealed by a tapered seat in the flange and a machined cone on the manifold.

Each flange is located on a short, straight pipe, which in turn is welded to the body of the catalytic converter. The pipe has a threaded boss which is welded over a hole to provide location for the Heated Oxygen Sensor (HO2S) in a position between the pre-catalyst and the main catalyst.

On the LH front section, the converter outlet pipe is a 60 mm (2.36 in) diameter tube, with a 1.5 mm (0.06 in) wall thickness, which is welded to the converter body. The rear of the outlet pipe is inserted into the flared end of the rear section. A clamp is used to compress and secure the joint.

On the RH front section, the converter outlet pipe is a 60 mm (2.36 in) diameter tube, with a 1.5 mm (0.06 in) wall thickness, which is welded to the converter body. The rear of the pipe curves left, under the transmission and then curves again to run parallel to the LH pipe. The end of the pipe has a welded flange with two holes which locate on two studs on the rear section and is secured with nuts. A metal gasket is used to seal the joint between the front and rear section flanges.

REAR SECTION

The rear section has a short 55 mm (2.16 in) diameter tube, with a 1.5 mm (0.06 in) wall thickness, which is flared to an inside diameter of 61 mm (2.4 in) to locate the LH front section. The tube is welded to the front silencer assembly. A second short 55 mm (2.16 in) diameter tube, with a 1.5 mm (0.06 in) wall thickness, has a welded flange with captive studs to provide attachment for the flange on the RH front section. This tube is also welded to the front silencer assembly.

The front silencer comprises a double skin and two end plates which are rolled together to give a capacity of 7.0 litres (427 in³). The silencer contains baffles and perforated tubes which reduce noise as the exhaust gases pass through the silencer. A hanger bar is welded to the front of the silencer and provides for the location of a mounting rubber.

The silencer has two short 55 mm (2.16 in) diameter outlet pipes, with a 1.5 mm (0.06 in) wall thickness, which connect to the centre silencer.

The centre silencer comprises two pressed stainless steel shells which are welded together to give a capacity of 25.2 litres (1538 in³). The silencer contains baffles and perforated tubes which reduce noise as the exhaust gasses pass through the silencer. A hanger bar is welded to the front right hand side of the silencer and provides location for a mounting rubber.

The silencer has two 55 mm (2.16 in) diameter outlet pipes, with a 1.5 mm (0.06 in) wall thickness, which are curved to pass around the rear suspension components.

Each outlet pipe terminates in a welded joint with the tail silencers. The outlet pipes have a hanger bar which provides for the location of a mounting rubber.

A hanger bar is welded to the front face of each rear silencer and provides for the location of a mounting rubber. The silencer is a rectangular fabrication with a baffle tube which is surrounded with glass fibre to provide further noise suppression. Each silencer has a capacity of 4 litres (244 in³).

The silencers each have an outlet pipe which is 60 mm (2.36 in) diameter, with a wall thickness of 1.2 mm (0.05 in). Each outlet pipe is curved downwards to direct exhaust gasses away from the rear of the vehicle.

EXHAUST MANIFOLDS

The cast exhaust manifolds are unique for each cylinder bank. Spacers on the securing bolts allow the manifolds to expand and retract with changes of temperature while maintaining the clamping loads. Heat shields are integrated into the exhaust manifold gaskets. Each manifold has a threaded port near to its outlet which allows for the fitment of the pre-catalyst HO2S.

CATALYTIC CONVERTERS

The engine management system provides accurately metered quantities of fuel to the combustion chambers to ensure the most efficient use of fuel and to minimise the exhaust emissions. A threaded boss is located on each manifold and a and another threaded boss is located between the starter and the main catalyst to house the pre and post catalyst oxygen sensors. The engine management system monitors the sensors and uses the information to further improve the fuelling and exhaust emissions.

To further reduce the carbon monoxide and hydrocarbons content of the exhaust gases, two catalytic converters are integrated into the front down pipe from each exhaust manifold. In the catalytic converter the exhaust gases are passed through honeycombed ceramic elements coated with a special surface treatment called 'washcoat'. The washcoat increases the surface area of the ceramic elements by a factor of approximately 7000. On top of the washcoat is a coating containing metals, which are the active constituent for converting harmful emissions into inert by-products. The metals add oxygen to the carbon monoxide and the hydrocarbons in the exhaust gases, to convert them into carbon dioxide and water respectively.

Two catalytic converters are used in each cylinder bank down pipe. A starter and main catalyst are located below the downpipe flange. The starter catalyst is monitored by two HO2S's. The main catalyst is not monitored.

Exhaust System - V8 5.0L Petrol - Exhaust System

Diagnosis and Testing

Principle of Operation

For a detailed description of the exhaust system, refer to the relevant Description and Operation section of the workshop manual. REFER to: [Exhaust System](#) (309-00D Exhaust System - V8 5.0L Petrol, Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

• **NOTE:** Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> ● Leaks ● Metal fatigue ● Pipes ● Catalytic converter ● Muffler(s) ● Joints ● Mountings ● Clearance around components 	<ul style="list-style-type: none"> ● Fuses ● Wiring harness ● Electrical connector(s) ● Sensor(s) ● Engine Control Module (ECM)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Causes	Action
Noisy or leaking exhaust	<ul style="list-style-type: none"> ● Exhaust system/components 	Install new components as necessary. Refer to the relevant section of the workshop manual.
Lack of power	<ul style="list-style-type: none"> ● Air intake system fault ● Restricted exhaust system ● Low fuel pressure 	Check the air intake system. Check for a blocked catalytic converter or muffler, install new components as necessary. Check the fuel pressure. Refer to the relevant section of the workshop manual.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.

Exhaust System - V8 5.0L Petrol - Catalytic Converter LH

Removal and Installation

Removal

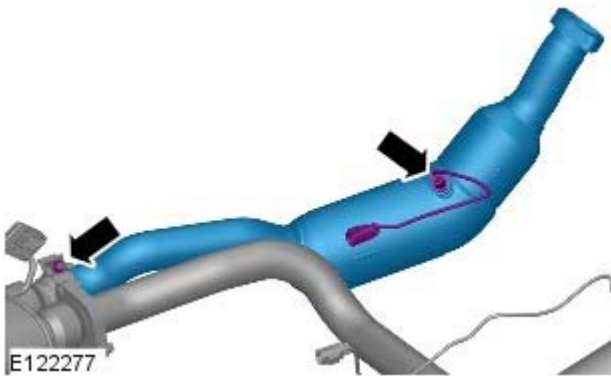
- NOTE: Removal steps in this procedure may contain installation details.

1.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Refer to: [Exhaust System](#) (309-00D Exhaust System - V8 5.0L Petrol, Removal and Installation).

3. Torque: 48 Nm



Installation

1. **1. CAUTIONS:**



Make sure the anti-seize compound does not contact the heated oxygen sensor (HO2S) tip.



If accidentally dropped or knocked install a new sensor.



Make sure the HO2S wiring harness is not twisted more than 180 degrees and is not in contact with either the exhaust or driveshaft.

- NOTE: If the original sensor is to be installed, apply lubricant meeting specification ESE-M12A4-A to the thread of the sensor.

To install, reverse the removal procedure.

Exhaust System - V8 5.0L Petrol - Catalytic Converter RH

Removal and Installation

Removal

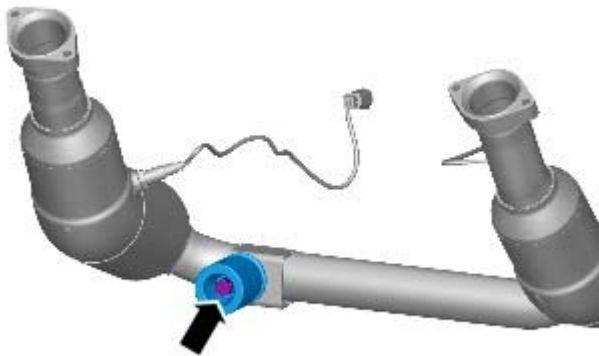
- NOTE: Removal steps in this procedure may contain installation details.

1.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

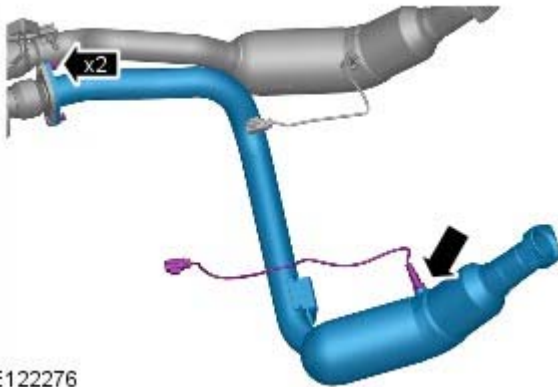
2. Refer to: [Exhaust System](#) (309-00D Exhaust System - V8 5.0L Petrol, Removal and Installation).

3. Torque: 22 Nm



E122319

4. Torque: 48 Nm



E122276

Installation

1. **CAUTIONS:**



Make sure the anti-seize compound does not contact the heated oxygen sensor (HO2S) tip.



If accidentally dropped or knocked install a new sensor.



Make sure the HO2S wiring harness is not twisted more than 180 degrees and is not in contact with either the exhaust or driveshaft.

- NOTE: If the original sensor is to be installed, apply lubricant meeting specification ESE-M12A4-A to the thread of the sensor.

To install, reverse the removal procedure.

Exhaust System - V8 5.0L Petrol - Exhaust System

Removal and Installation

General Equipment

Transmission jack

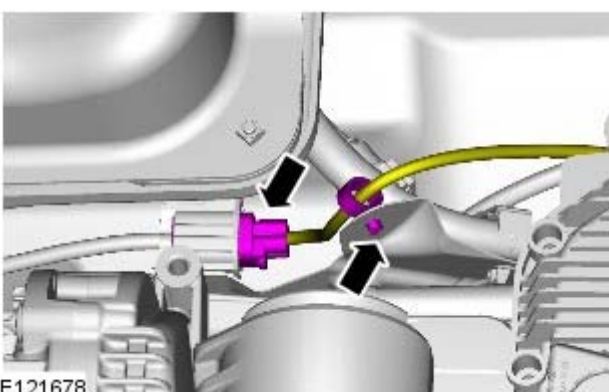
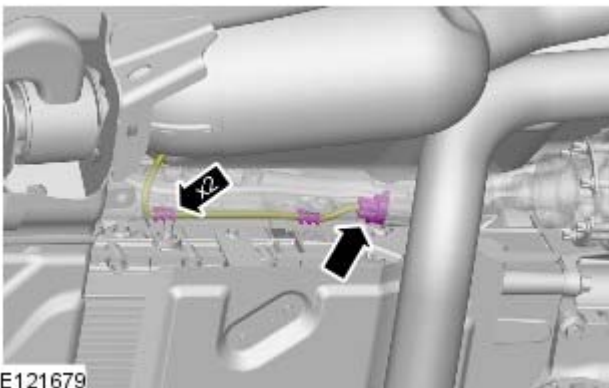
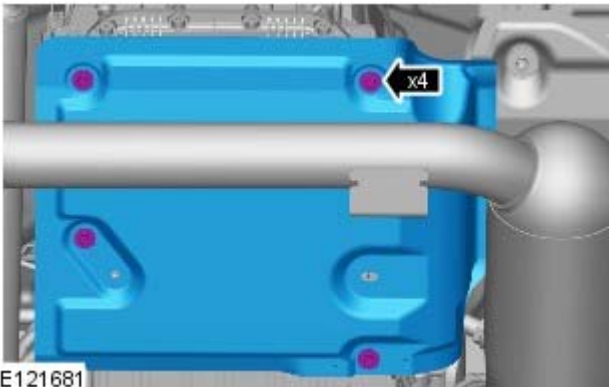
Removal

1.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

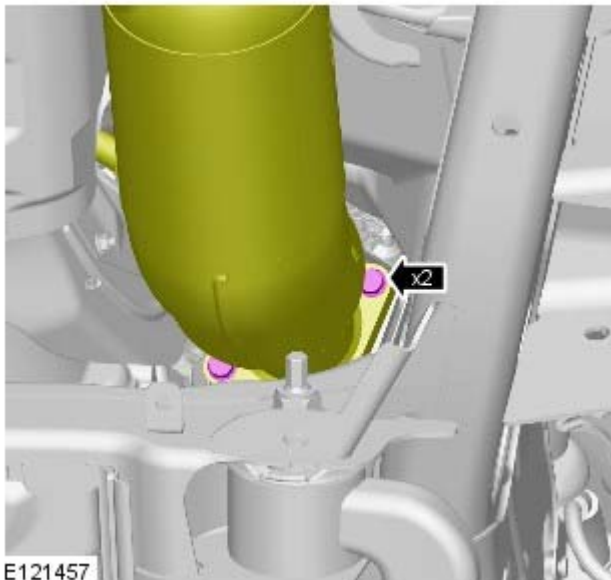
2. Refer to: [Engine Undershield](#) (501-02 Front End Body Panels, Removal and Installation).
3. Refer to: [Transmission Support Crossmember - V8 5.0L Petrol](#) (502-02 Full Frame and Body Mounting, Removal and Installation).

4. Torque: 10 Nm



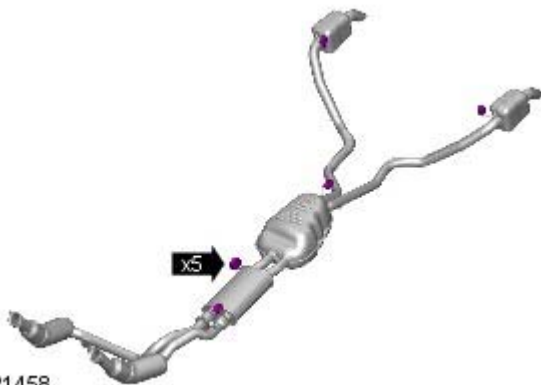
- 5.


- 6.



8. **8.** NOTE: Right-hand shown, left-hand similar.

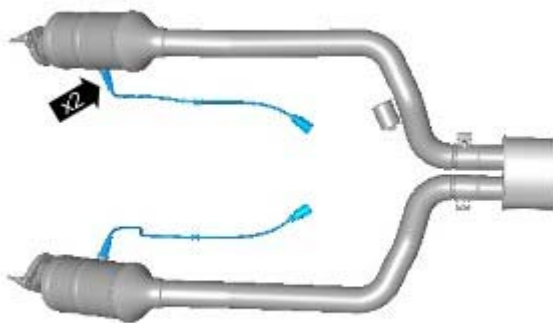
Torque: 22 Nm



9. **9.**  CAUTION: Make sure that the exhaust system is supported with suitable retaining straps.

With assistance, remove the exhaust system.

General Equipment: [Transmission jack](#)



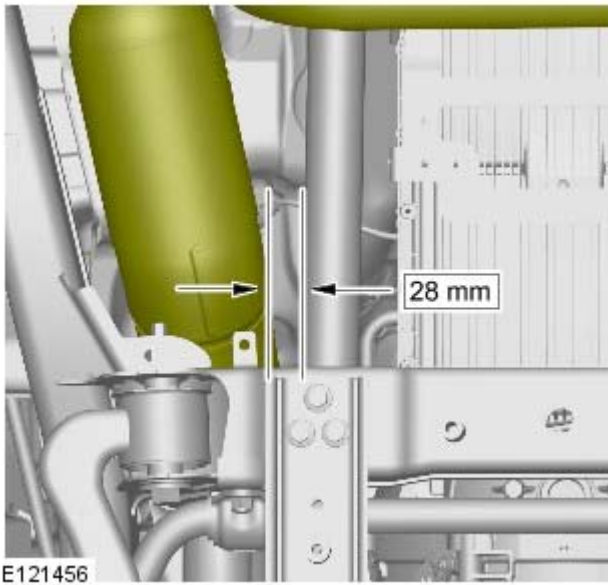
10. **10.** NOTE: Do not disassemble further if the component is removed for access only.


- NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Torque: 45 Nm

Installation

1. To install, reverse the removal procedure.

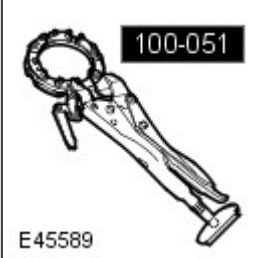


2.  CAUTION: Make sure there is a clearance (A) of 25 mm to 30 mm between the closest points of the LH catalytic converter and the front driveshaft.

Exhaust System - V8 5.0L Petrol - Front Muffler

Removal and Installation

Special Tool(s)

	100-051 Cutter, Exhaust Pipe
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General Equipment

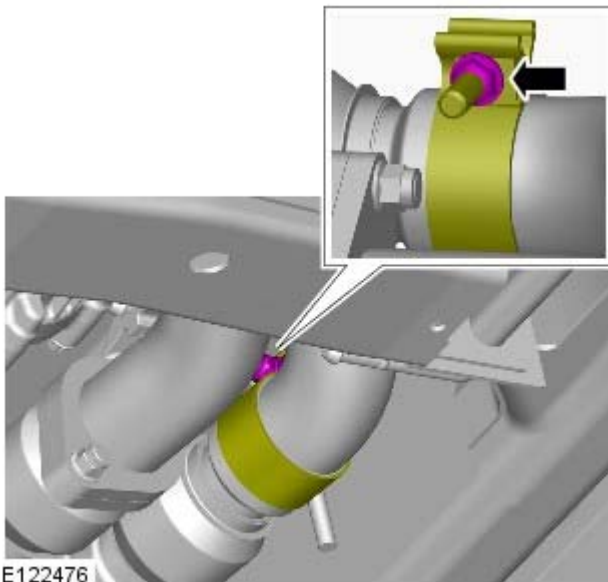
Transmission jack

Removal

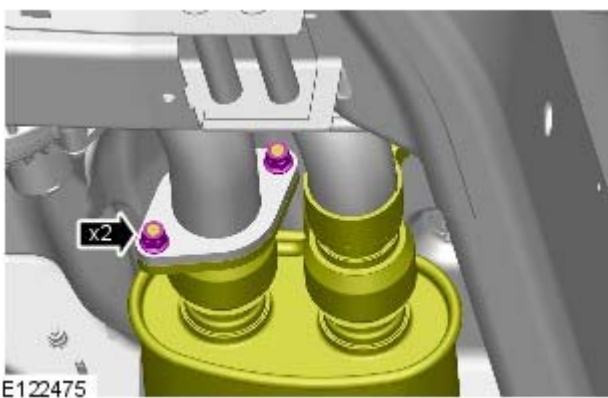
1.  **WARNING:** Make sure to support the vehicle with axle stands.

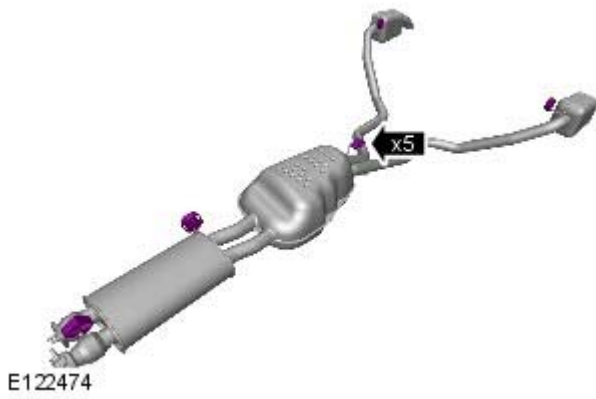
Raise and support the vehicle.

2.



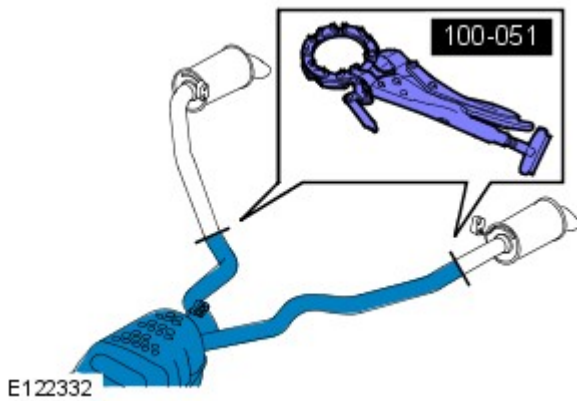
3. Discard the gasket.





4. With assistance, remove the muffler assembly.

General Equipment: [Transmission jack](#)



5. Using the special tool, cut the exhaust pipe at the marked position.

Special Tool(s): [100-051](#)

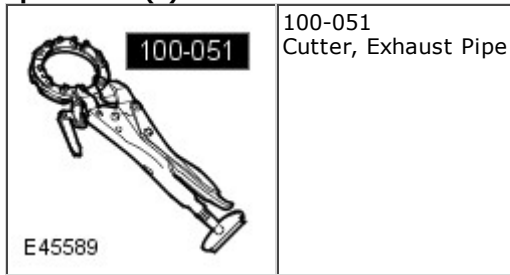
Installation

1. **1.** NOTE: Do not tighten the retaining clamp at this stage.
Position the RH tail pipe to the muffler assembly.
2. **2.** NOTE: Do not tighten the retaining clamp at this stage.
Position the LH tail pipe to the muffler assembly.
3. **3.** NOTE: Install a new gasket.
With assistance, install the muffler assembly.
4. Align both tail pipes and tighten the retaining clamps to 55 Nm (40 lb.ft).
5. Tighten the catalytic converter nuts and clamp to 48 Nm (35 lb.ft).

Exhaust System - V8 5.0L Petrol - Rear Muffler

Removal and Installation

Special Tool(s)

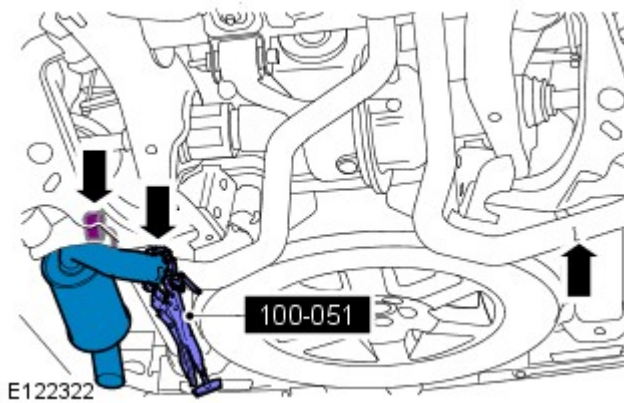


Removal

- NOTE: Removal steps in this procedure may contain installation details.

1.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.



2. **2.** NOTE: Right-hand shown, left-hand similar.

- NOTE: Using the special tool, cut the exhaust pipe at the marked position.

Remove the tail pipe.

Special Tool(s): [100-051](#)

Installation

1. **1.** NOTE: Do not tighten the retaining clamp at this stage.

- NOTE: Clean the components.
- NOTE: Install the retaining clamp.

Install the tail pipe.

2. Align the tail pipe and tighten the retaining clamp to 55 Nm (40 lb.ft).